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# SENSORY ANALYSIS OF STORED TRAY PACK FOODS

BY

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| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)<br>Tray pack foods were evaluated by a sensory panel of civilian and military employees of the U.S. Army Natick Research, Development & Engineering Center. Purpose of the study was to measure consumer acceptability of various items over required storage periods of 12 months at 100°F (38°C) and 36 months at 70°F (21°C). A 40°F (4°C) control condition was also included. Each test was conducted with a minimum of 36 consumer panelists who rated the acceptability of each item in quadruplicate (4 traycans withdrawn from each of 4 cases) on a 9 point hedonic scale where 1 represented dislike extremely and 9 represented like extremely. Products were rated initially and withdrawn from storage at 12, 24 and 36 months at 70°F and at 6 and 12 months at 100°F. Tray pack items meeting minimum acceptability criteria (5.0 or greater for 2 consecutive withdrawals) were retained in the study. Those that rated below 5.0 for two consecutive withdrawals were either deleted as having failed or were reformulated by the Food Engineering Directorate. Results indicated that ratings for the majority of items changed significantly over time. Significant changes from initial |       |   |  |  |                                 |
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ratings occurred for 38 out of 56 products across 12, 24 and 36 month withdrawals at 70°F. Significant changes from initial ratings also occurred for 36 out of 56 products across 6 and 12 month withdrawals at 100°F. No consistent pattern of ratings occurred, either across all products or within the food categories as defined in the report. There was a main effect of temperature on acceptability at 12 months storage; 22 out of 56 products stored at 70°F rated significantly higher than at 100°F. Results suggested that since many of the products received favorable ratings at the final withdrawal, they may be acceptable beyond three years.

## PREFACE

The Sensory Analysis Section (SAS), Human Factors & Food Habits Branch, Behavioral Sciences Division, Science & Advanced Technology Directorate conducts all consumer and technological panels for all military foods introduced at the U. S. Army Natick Research, Development and Engineering Center. In October, 1983, a storage study known as "The Sensory Analysis of Stored Tray Packs" began in SAS. This is a support work unit (BB 143) whose purpose is to collect and statistically analyze consumer acceptance data and provide information on the current status of the Tray Pack products to the Food Engineering Directorate.

### ACKNOWLEDGMENTS

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## INTRODUCTION

Tray Pack Rations were developed to meet the challenge of providing hot, nutritionally adequate prepared foods to the present day and future highly mobile soldier in combat. Research on Tray Packs started in the early 1970's, born out of the rapidly developing need for food convenience.<sup>1</sup> By the mid-1970's working models of this design had been produced by both Kraft, Inc., and Central States Can Company, independently of each other.<sup>2</sup>

Test marketing of five entrees in the Kraft container yielded high acceptability ratings in three different food service settings - a private hospital, a university and a public school system.<sup>3</sup> At about the same time, the four U. S. military services were developing their own version of the Tray Pack. All consumer acceptance data collected prior to this study indicated that the great majority of Tray Pack formulated foods were evaluated as being as acceptable or more acceptable than similar items that were freshly prepared.<sup>4</sup>

Because the Tray Pack Rations, otherwise known as T Packs, require no preparation other than heating in boiling water, there is a significant savings in manpower, water and fuel. The flat configuration of the tray creates potential for better food quality than a round metal can, since the heat processing time required for sterility is shortened.<sup>5</sup> The T Rations consist of a wide variety of entrees, vegetables, starches and desserts which are heat-processed and hermetically sealed in metal

containers. This new technology was intended to deliver hot meals with the Mobile Food Service Unit (MFSU) directly to troops, as well as feed isolated groups with insulated carriers. Each container is composed of a single food item designed to feed 12 or 18 soldiers. It fits into a half-size steam table and functions as both a container and server.

Since the ultimate goal was to provide soldiers with acceptable meals that were shelf stable for 3 years at 70°F, it was essential to collect acceptability data from consumers in order to assure the Food Engineering Directorate that this goal was met.

## EXPERIMENTAL DESIGN

### Test Plan

Consumer sensory evaluations were conducted according to a test plan dated 21 October 1983.<sup>6</sup> Objective of the study was to "evaluate the ability of each item to meet a storage requirement of three (3) years at 70°F." The plan called for 40 (4°C), 70 (21°C), and 100°F (38°C) controlled temperature storage of commercially produced items. At each withdrawal from storage, one (1) can was to be removed from each of four (4) cases of the test item. The withdrawal schedule called for evaluation of the 40° stored items on an "as deemed necessary" basis at 24 and 36 months, the 70° items at 12, 24, and 36 months, and the 100° items at 6 and 12 months.

The test plan called for 36 consumer panelists rating samples on the nine-point hedonic scale (Appendix A). Comments were allowed. Products stored at each temperature were to be evaluated in quadruplicate (four traycans to be withdrawn from each of four cases). Separate panels were to be conducted for each temperature condition. Evaluations were to continue up to the maximum storage time at each temperature, on those products obtaining mean ratings of 5.0 or above. In the event that the mean dropped below 5.0 at two consecutive withdrawals, a technological panel, which is composed of professional food technologists, was to decide whether to reformulate or continue testing the product.

In addition to the requirements stated in the test plan, at the request of the project leader, a group of three food technologists, previously trained in flavor profiling, reviewed all initially tested products for salient sensory characteristics. The technologists responsible for development also attended these sessions to answer development, formulation and processing questions. Prestorage descriptions were developed for the general categories of appearance, odor, flavor, and texture (Appendix B). Following testing of the same items withdrawn from storage, printouts of voluntary consumer panel comments were examined for evidence of sensory changes, particularly development of off characteristics, from the original descriptions. A sample of such printouts is in Appendix C. Changes from the original characteristics, if any, after each storage interval were recorded for later incorporation into a manual for inspection purposes.

Additional traycans of each product were held for microbiological and/or chemical analysis in the event that food deterioration was observed or on an "as needed" basis. Proximate, mineral, vitamin, and fatty acid analyses were conducted on the initial samples only. Beginning in late 1983 as procurement and production of the items was completed, initial testing and storage of the 56 products (Appendix D) evaluated in this study commenced. On average, from 6 to 10 items were evaluated per month.

### Heating and Serving Samples

The four traycans required for each test were heated simultaneously for 15-45 minutes in boiling water depending on the item. Center temperature of heated cans was 160-165°. Heating was accomplished in a 10 gallon cylindrical aluminum pot fitted with a specially constructed, welded rod holder. Traycans were inserted vertically into the holder and immersed in the water. The holder facilitated water contact on all sides of the cans. Solid pack items without sauces or gravies, e.g., rice, were heated for 55 minutes. After heating, cans were opened with an Edlund No.1 bayonet-type can opener equipped with an enlarged base to support a rectangular container. Care was required in opening bulging heated cans to avoid scalding injury. Heated opened traycans were transferred to a waterbath in Natick's Sensory Analysis Section Laboratory where they were held at 160° during the serving period, typically one hour. Samples were served one at a time through ports connecting the food preparation/holding area to panelists seated in individual booths.

### Selection of Panelists

Consumer panelists were selected from a random listing of 500 employees of the U.S. Army Natick RD&E Center. These individuals had previously volunteered their interest in sensory tests and had no previous training other than in the use of the test method. They were contacted by telephone on the day of an evaluation.

### Data Collection

Most of the initial evaluations, starting in 1983, were conducted using paper forms, i.e., the hedonic scale printed on a computer card and instructions posted in the individual testing booths. Later evaluations (1985) were conducted with a computer aided sensory evaluation system.<sup>7</sup> The system eliminated paper forms and performed all the following functions of the test design previously done manually or in a semi-automated mode: random listing of the panel roster, display of test instructions, randomization of sample order, presentation of the hedonic scale with associated scores for verbal scale categories as well as space for typed comments, timed 20-second intervals between sample presentations, storage of scores and comments, computation of the analysis of variance with post-hoc Newman-Keuls test for differences between mean scores, and a printout of the analyzed data and comments. Each of nine test booths was equipped with a video display terminal on which instructions and interview questions were displayed and a keyboard for entering the interactive responses. To determine the statistical significance of storage time/temperature effects, it was necessary to reenter all raw data into a personal computer (PC) data entry program for analysis with a PC statistical package because data were collected using two modes during the study.



## RESULTS

Data from the 70°F and the 100°F storage temperature conditions were analyzed separately using two-way analysis of variance. The ANOVA's tested the effects of Tray Pack sample and time in storage on Tray Pack acceptability. Acceptability was measured with the hedonic rating scale described previously.

Taste test sessions were held at 0, 12, 24, and 36 months in the 70°F condition, and at 0, 6, and 12 months in the 100°F degree condition. During each session, subjects tasted four samples of one Tray Pack item. These samples were pulled from the same packaging lot. Although it was unlikely that significant differences would be found among samples from the same lot, package identification was included as a variable in the analyses. In the following summary, the effects of sample lot will not be mentioned unless the results were significant.

In addition, two-way ANOVA's were conducted to test the effects of storage temperature and Tray Pack sample on food acceptability at 12 months of storage. Twelve months was the time at which Tray Packs from both temperature conditions were tested.

Student-Newman-Keuls multiple comparisons were computed post hoc when F ratios significant at  $p < .05$  were found.

The results of the analyses are presented by food category, one product at a time. Tables of descriptive statistics and bar graphs follow each of the individual category listings. Bar graphs are also included at the end of each section.

## 1. POULTRY

### Chicken A La King

At 70°F, the effect of time on acceptability failed to meet statistical significance ( $F(3,429)=2.55$ ,  $p<.055$ ). However, post hoc tests revealed that there were no differences among ratings at any of the four test times.

There were no other significant findings with this Tray Pack item.

### Chicken Slices with Gravy

The effect of time on taste ratings was significant at 70°F ( $F(3,572)=5.87$ ,  $p<.001$ ). The mean initial rating ( $\bar{x}=6.48\pm1.53$ ) was significantly higher than the mean rating at 12 months ( $\bar{x}=5.91\pm1.78$ ) and 36 months ( $\bar{x}=5.86\pm1.69$ ). Ratings at 24 months ( $\bar{x}=6.41\pm1.45$ ) were also significantly higher than those at 12 and 36 months.

At 100°F, the effect of time on acceptability was also significant ( $F(2,424)=3.83$ ,  $p<.022$ ). Mean ratings decreased significantly over time from  $\bar{x}=6.48(\pm 1.53)$  at 0 months, to  $\bar{x}=5.96(\pm 1.84)$  at 12 months.

Storage temperature did not have a significant influence on acceptability ratings at 12 months.

#### Chicken Stew

At 70°F, mean ratings for Tray Pack acceptability did not differ significantly over time.

There was a significant effect of time on sample ratings in the 100°F condition ( $F(2,444)=3.47$ ,  $p<.032$ ). Tests showed that ratings decreased significantly from 6 months ( $\bar{x}=7.14\pm 1.31$ ) to 12 months ( $\bar{x}=6.72\pm 1.42$ ).

At 12 months, Tray Packs stored at 70°F were more acceptable than those stored at 100°F ( $F(1,296)=4.50$ ,  $p<.035$ ). The mean rating of acceptability for the 70°F Tray Packs ( $\bar{x}=7.04\pm 1.23$ ) was higher than the one for the 100°F Tray Packs ( $\bar{x}=6.72\pm 1.42$ ).

#### Chicken Breast With Gravy

The effect of time on acceptability was significant in the 70°F condition ( $F(3,596)=5.54$ ,  $p<.001$ ). Mean acceptability ratings

decreased significantly from initial measurement ( $x=7.00\pm1.32$ ) to 12 months ( $x=6.43\pm1.58$ ) and from initial measurement to 24 months ( $x=6.45\pm1.30$ ).

There was no effect of time on acceptability at 100°F.

At 12 months, there was a significant effect of temperature on acceptability ( $F(1,296)=13.96$ ,  $p<.0001$ ) such that mean ratings were higher in the 100°F condition ( $x=7.02\pm1.12$ ) than they were in the 70°F condition ( $x=6.43\pm1.58$ ).

#### Chicken and Noodles

The effect of time on Tray Pack taste ratings was highly significant in the 70°F storage condition ( $F(3,584)=6.28$ ,  $p<.0001$ ). There were significant increases in ratings from 0 months ( $x=6.57\pm1.45$ ) to 24 months ( $x=7.01\pm1.18$ ) and from 0 to 36 months ( $x=7.03\pm1.26$ ). There were also significant increases from 12 months ( $x=6.50\pm1.54$ ) to both 24 and 36 months.

The effect of time was also highly significant in the 100°F condition ( $F(2,444)=9.99$ ,  $p<.0001$ ). The rating of the entree was highest at 6 months ( $x=7.12\pm1.21$ ) and differed significantly from ratings at 0 months ( $x=6.57\pm1.45$ ) and 12 months ( $x=6.43\pm1.53$ ).

Acceptability was not influenced by temperature at 12 months of measurement.

#### Chicken Cacciatore

The effect of time on acceptability for the 70°F Tray Packs was significant such that  $F(3,592)=4.57$  ( $p<.004$ ). The lowest rating of the Tray Pack was at 12 months ( $\bar{x}=6.78\pm1.41$ ). This mean differed at the  $p<.05$  level from ratings at 0 months ( $\bar{x}=7.16\pm1.20$ ) and at 24 months ( $\bar{x}=7.26\pm1.01$ ).

At 100°F, Tray Pack acceptability was also significantly influenced by time ( $F(2,448)=3.56$ ,  $p<.029$ ). Post hoc tests showed that initial ratings ( $\bar{x}=7.16\pm1.20$ ) were higher than those at 12 months ( $\bar{x}=6.78\pm1.26$ ).

There was no effect of temperature on Tray Pack acceptability at 12 months.

#### Turkey Slices

There were no significant results with this Tray Pack.

TABLE 1  
POULTRY HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Chicken a la King

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.79                 | 1.43                 | 108      |
| 6 mo<br>100°F        | 6.96                 | 1.41                 | 108      |
| 12 mo<br>70°F        | 7.03                 | 1.18                 | 111      |
| 12 mo<br>100°F       | 6.71                 | 1.56                 | 114      |
| 24 mo<br>70°F        | 6.72                 | 1.43                 | 108      |
| 36 mo<br>70°F        | 7.15                 | 1.23                 | 114      |

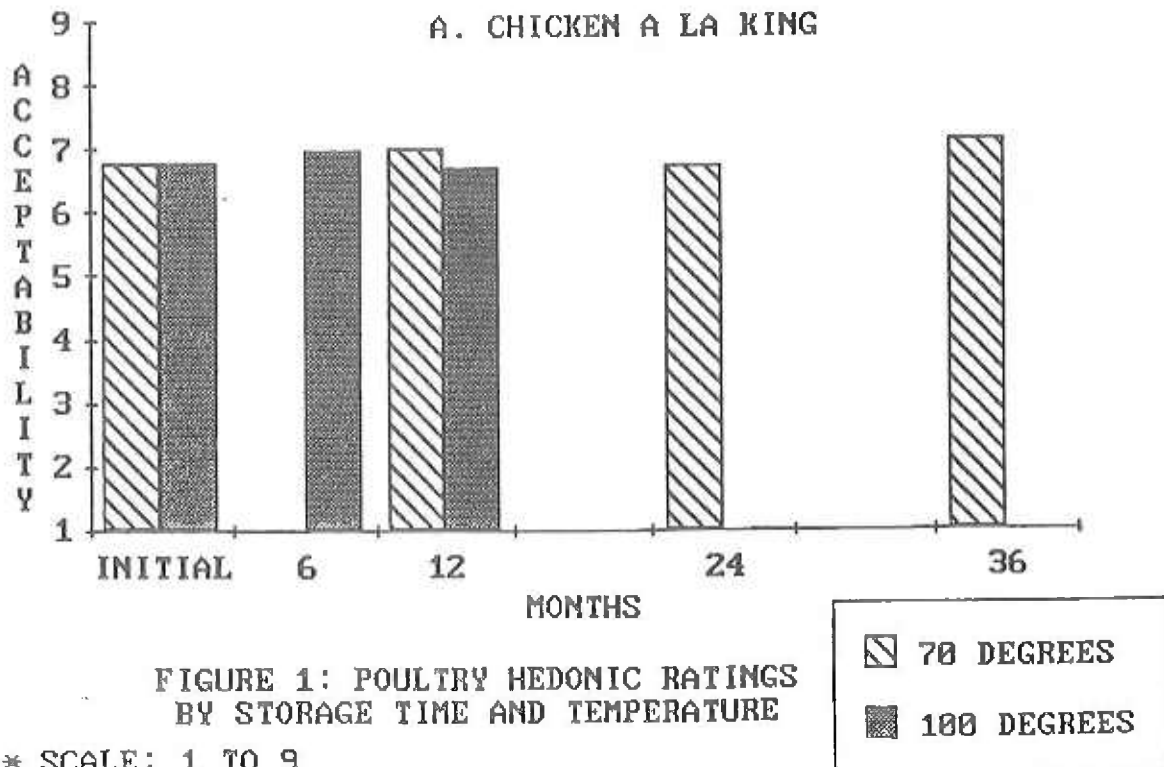




TABLE 1 (con'd)

B. Chicken Slices with Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.48                 | 1.53                 | 144      |
| 6 mo<br>100°F        | 6.27                 | 1.40                 | 144      |
| 12 mo<br>70°F        | 5.91                 | 1.78                 | 144      |
| 12 mo<br>100°F       | 5.96                 | 1.84                 | 148      |
| 24 mo<br>70°F        | 6.41                 | 1.45                 | 152      |
| 36 mo<br>70°F        | 5.86                 | 1.69                 | 148      |

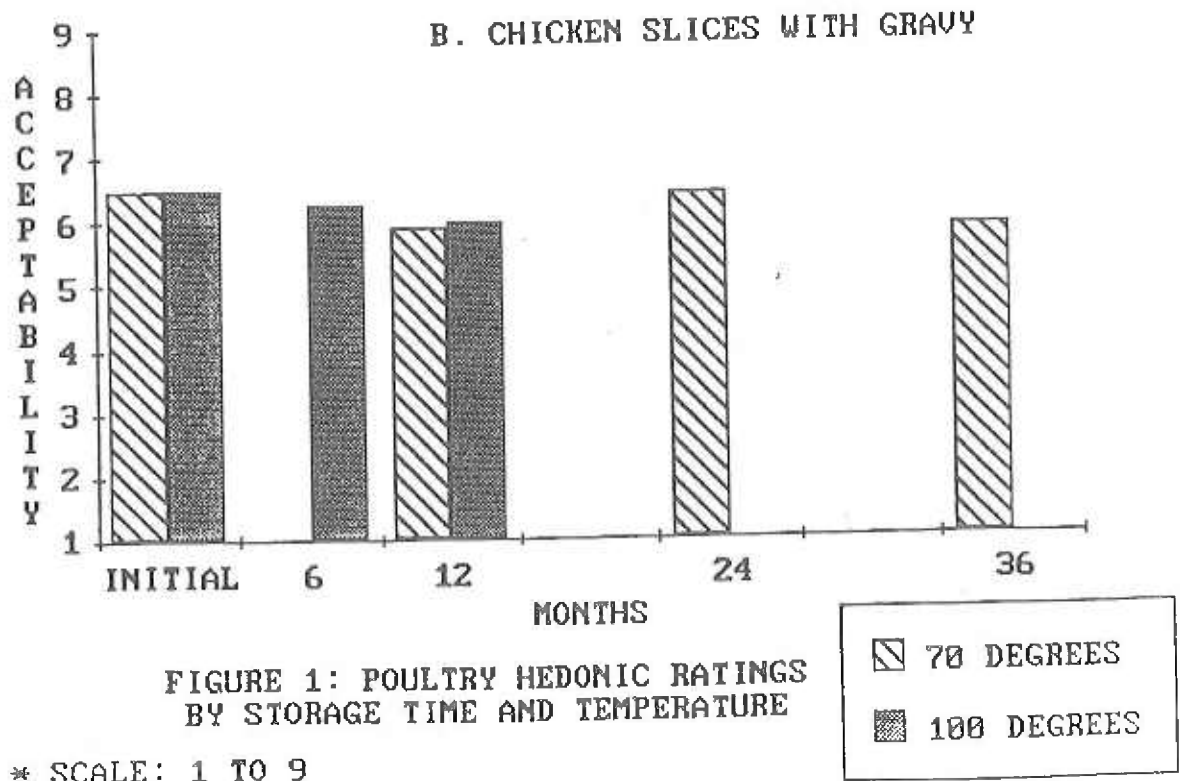


TABLE 1 (con'd)

C. Chicken Stew

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.92                 | 1.50                 | 152      |
| 6 mo<br>100°F        | 7.14                 | 1.31                 | 152      |
| 12 mo<br>70°F        | 7.04                 | 1.23                 | 152      |
| 12 mo<br>100°F       | 6.72                 | 1.42                 | 152      |
| 24 mo<br>70°F        | 7.19                 | 1.07                 | 152      |
| 36 mo<br>70°F        | 7.07                 | .91                  | 152      |

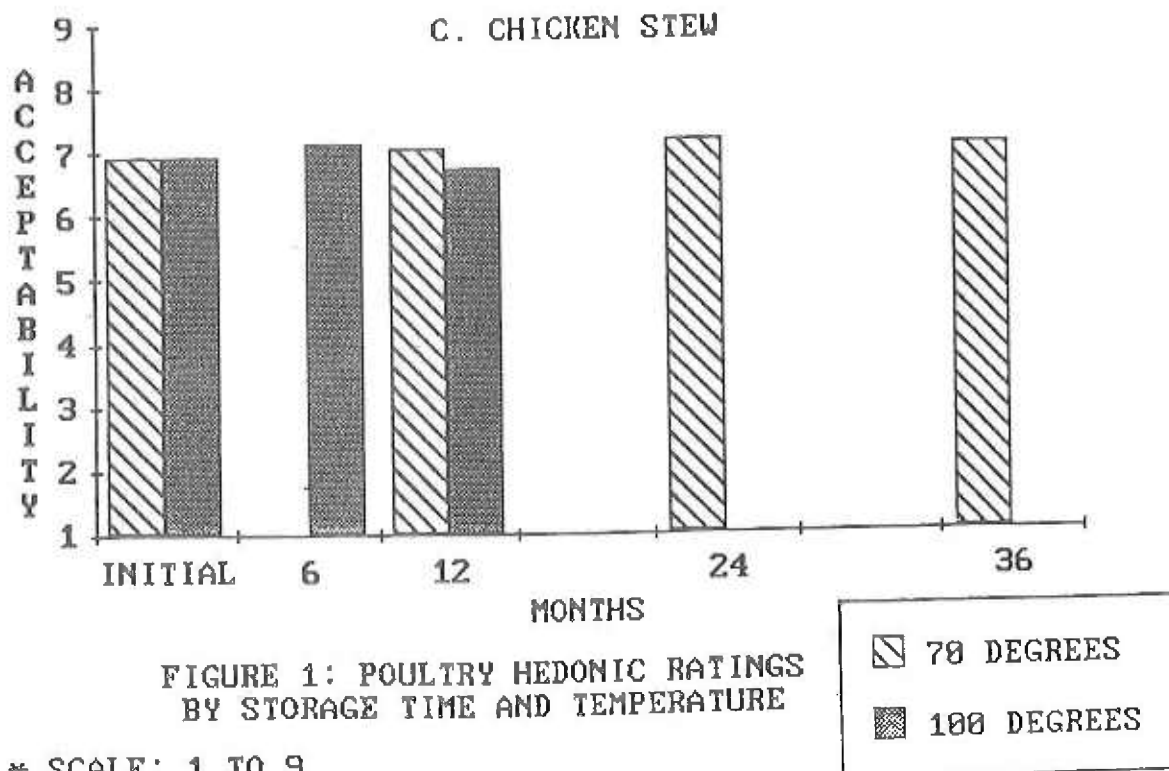


TABLE 1 (con'd)

D. Chicken Breast with Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 7.00                 | 1.32                 | 152      |
| 6 mo<br>100°F        | 6.79                 | 1.21                 | 144      |
| 12 mo<br>70°F        | 6.43                 | 1.58                 | 152      |
| 12 mo<br>100°F       | 7.02                 | 1.12                 | 152      |
| 24 mo<br>70°F        | 6.45                 | 1.30                 | 152      |
| 36 mo<br>70°F        | 6.76                 | 1.47                 | 156      |

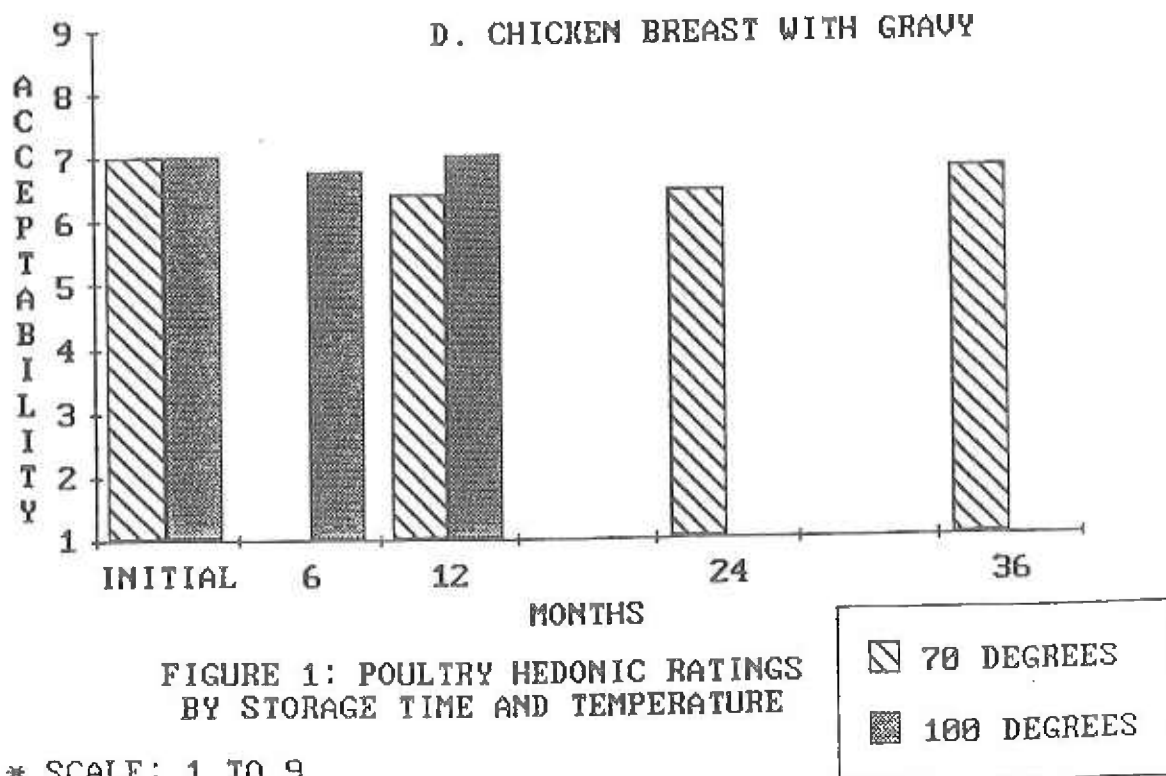


TABLE 1 (con'd)

E. Chicken & Noodles

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.57                 | 1.45                 | 152      |
| 6 mo<br>100°F        | 7.12                 | 1.21                 | 152      |
| 12 mo<br>70°F        | 6.50                 | 1.54                 | 144      |
| 12 mo<br>100°F       | 6.43                 | 1.53                 | 152      |
| 24 mo<br>70°F        | 7.01                 | 1.18                 | 152      |
| 36 mo<br>70°F        | 7.03                 | 1.26                 | 152      |

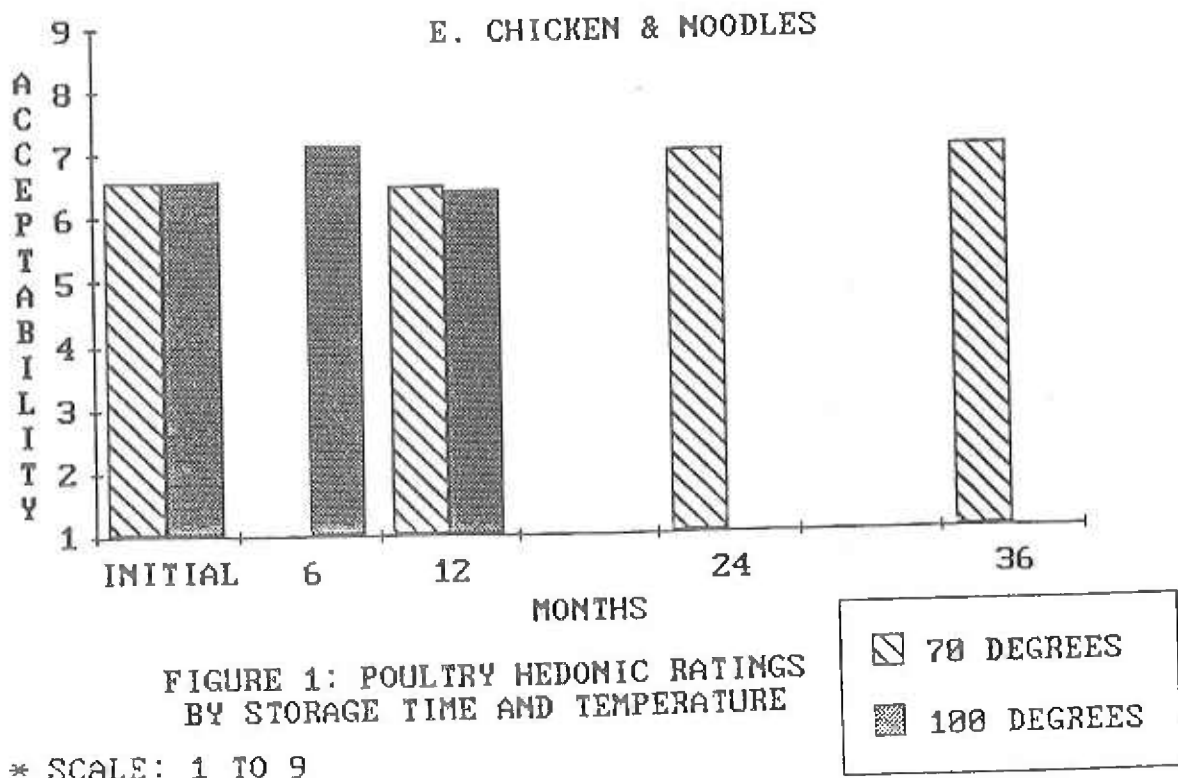


TABLE 1 (con'd)

F. Chicken Cacciatore

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 7.16                 | 1.20                 | 152      |
| 6 mo<br>100°F        | 7.03                 | 1.37                 | 148      |
| 12 mo<br>70°F        | 6.78                 | 1.41                 | 156      |
| 12 mo<br>100°F       | 6.78                 | 1.26                 | 160      |
| 24 mo<br>70°F        | 7.26                 | 1.01                 | 148      |
| 36 mo<br>70°F        | 6.98                 | 1.24                 | 152      |

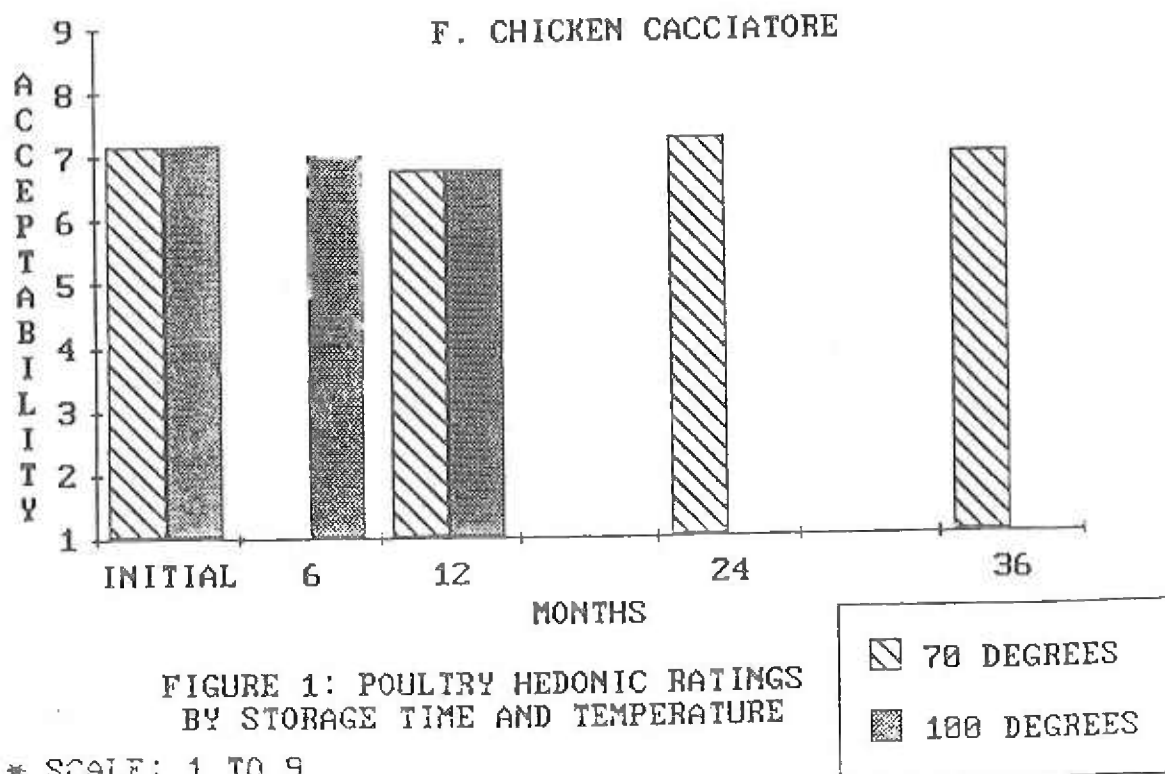
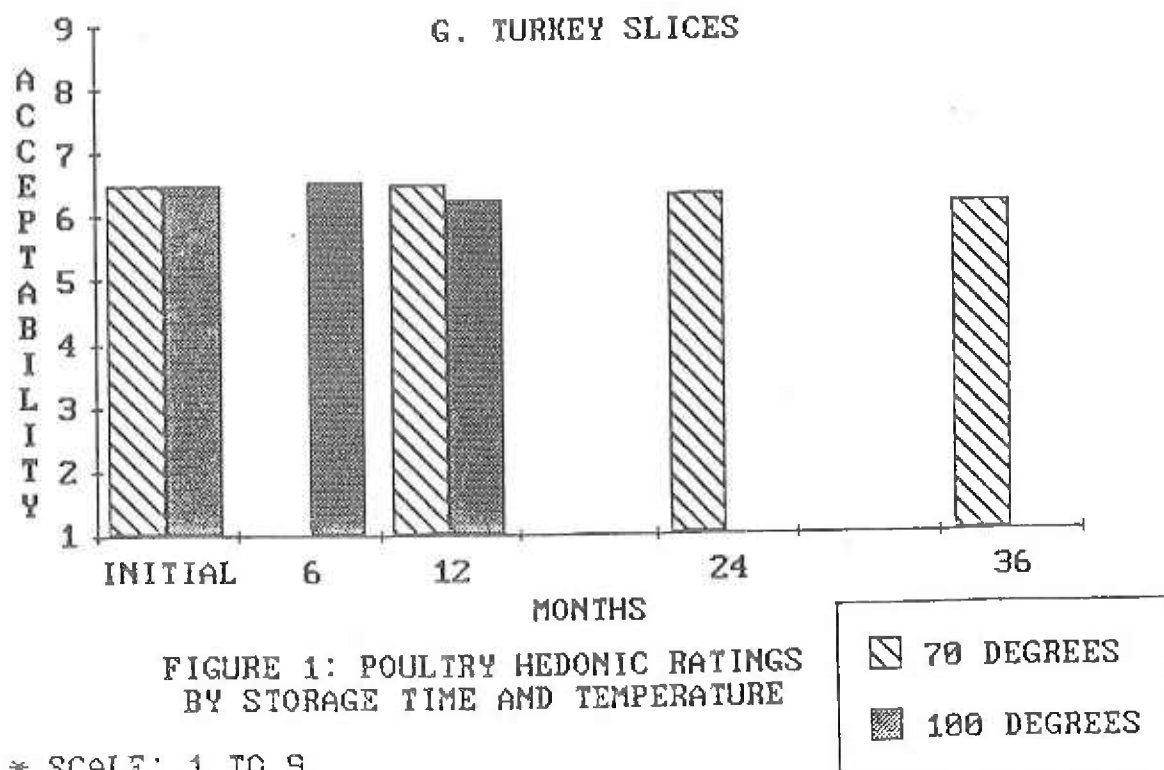


TABLE 1 (con'd)

G. Turkey Slices

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.49                 | 1.32                 | 144      |
| 6 mo<br>100°F        | 6.55                 | 1.61                 | 152      |
| 12 mo<br>70°F        | 6.51                 | 1.49                 | 144      |
| 12 mo<br>100°F       | 6.25                 | 1.74                 | 152      |
| 24 mo<br>70°F        | 6.34                 | 1.44                 | 152      |
| 36 mo<br>70°F        | 6.19                 | 1.57                 | 148      |





## 2. BEEF PRODUCTS

### Beef Stew

There were no significant findings with this Tray Pack.

### Beef with BBQ Sauce

In the 70°F condition, the acceptability of this product was significantly affected by time in storage ( $F(3,568)=7.77, p<.0001$ ). Post hoc tests showed that the mean rating at 36 months ( $x=5.91\pm1.70$ ) was significantly lower than ratings at 0 months ( $x=6.37\pm1.40$ ), 12 months ( $x=6.61\pm1.55$ ), and 24 months ( $x=6.74\pm1.64$ ).

There was no effect of time on Tray Pack acceptability in the 100°F condition.

At 12 months of testing, the effect of temperature on acceptability was significant at  $p<.014$  ( $F(1,280)=6.16$ ). Subjects rated the Tray Packs stored at 70°F higher ( $x=6.61\pm1.55$ ) than those stored at 100°F ( $x=6.14\pm1.66$ ).

### Roast Beef in Gravy

There were no significant findings with this Tray Pack.

### Beef Pepper Steak

Time had a significant effect on Tray Pack acceptability in the 70°F condition ( $F(3,564)=4.97$ ,  $p<.002$ ). Mean acceptability ratings at 24 months ( $\bar{x}=7.07\pm1.55$ ) were significantly higher than those at 0 months ( $\bar{x}=6.58\pm1.41$ ), 12 months ( $\bar{x}=6.44\pm1.57$ ), and 36 months ( $\bar{x}=6.73\pm1.26$ ).

There was no influence of time on acceptability with the Tray Packs stored in 100°F.

At 12 months of storage, no difference was found between mean acceptability ratings at 70°F and 100°F.

### Meatloaf in Gravy

At 70°F, time did not have an effect on acceptability of this Tray Pack.

The effect of time was significant at 100°F ( $F(2,424)=7.18$ ,  $p<.001$ ). Taste testers rated the Tray Pack higher initially ( $\bar{x}=6.69\pm1.43$ ) than they did at 6 months ( $\bar{x}=6.00\pm1.71$ ) and at 12 months ( $\bar{x}=6.30\pm1.49$ ).

There was no effect of storage temperature on acceptability at 12 months.

### Creamed Ground Beef

The effect of time was significant in the 70°F condition ( $F(3,568)=3.42$ ,  $p<.017$ ). Initial ratings were lowest ( $\bar{x}=5.92\pm1.62$ ) and differed significantly from ratings at all other times.

There was no effect of time on ratings of this Tray Pack at 100°F.

At 12 months, mean ratings were higher in the 70°F condition ( $\bar{x}=6.29\pm1.67$ ) than they were in the 100°F condition ( $\bar{x}=5.74\pm1.66$ ). This difference was significant at  $p<.006$  ( $F(1,284)=7.81$ ).

### Swedish Meatballs

Time had an effect on mean ratings of acceptability in both the 70°F and 100°F conditions. At 70°F, this effect was significant such that  $F(3,592)=4.52$  ( $p<.004$ ). Initial ratings ( $\bar{x}=6.95\pm1.28$ ) were significantly higher than all other ratings.

At 100°F, the effect of time was significant ( $F(2,444)=8.63$ ,  $p<.0001$ ). Ratings were significantly higher at 0 months ( $\bar{x}=6.95\pm1.28$ ) than at 6 months ( $\bar{x}=6.36\pm1.47$ ) and at 12 months ( $\bar{x}=6.25\pm1.86$ ).

There was no difference between the mean ratings at 70°F and 100°F after 12 months of storage.

### Stuffed Peppers

The effect of time on acceptability was not significant in the 70°F condition.

At 100°F, the effect of time was highly significant ( $F(2,400)=9.83$ ,  $p<.0001$ ). Post hoc tests showed that initial ratings ( $\bar{x}=7.02\pm1.16$ ) were higher than ratings at 6 months ( $\bar{x}=6.34\pm1.55$ ) and 12 months ( $\bar{x}=6.56\pm1.19$ ).

Tray Pack acceptability was not affected by storage temperature at 12 months.

### Beef with Carrots

Time had a significant influence on ratings of the Tray Packs stored at 70°F ( $F(3,580)=5.91$ ,  $p<.001$ ). Ratings at 12 months ( $\bar{x}=6.29\pm1.56$ ) were significantly lower than those at all other times.

At 100°F, time also affected acceptability ratings ( $F(2,436)=5.40$ ,  $p<.005$ ). The Tray Pack was rated highest initially ( $\bar{x}=6.73\pm1.39$ ) and this mean differed significantly from means at 6 months ( $\bar{x}=6.24\pm1.64$ ) and 12 months ( $\bar{x}=6.20\pm1.64$ ).

Tray Pack acceptability was not affected by temperature after 12 months of storage.

### Chili Con Carne

At 70°F storage, there was a highly significant effect of time on Tray Pack acceptability ( $F(3,592)=8.3$ ,  $p<.0001$ ). Acceptability ratings at 0 months ( $x=6.44\pm1.53$ ) and 12 months ( $x=6.52\pm1.67$ ) each were significantly lower than ratings at 24 months ( $x=7.10\pm1.07$ ) and 36 months ( $x=6.99\pm1.30$ ).

There was a highly significant effect of time in the 100°F condition as well ( $F(2,436)=9.43$ ,  $p<.0001$ ). Acceptability ratings were significantly higher at 6 months ( $x=7.16\pm1.51$ ) than they were at 0 months ( $x=6.44\pm1.53$ ) and 12 months ( $x=6.76\pm1.26$ ).

There was no difference between ratings of the 70°F and 100°F Tray Pack at 12 months.

### Beef Tips with Gravy

At 70°F, the effect of time on Tray Pack acceptability was significant at  $p<.006$  ( $F(3,588)=4.20$ ). Ratings at 24 months ( $x=6.39\pm1.48$ ) were significantly lower than all other ratings.

At 100°F, time had a highly significant effect on acceptability ( $F(2,436)=9.08$ ,  $p<.0001$ ). Tray Pack acceptability decreased over time such that ratings at 12 months ( $x=6.28\pm1.40$ ) were significantly lower than those at 0 months ( $x=6.92\pm1.27$ ) and 6 months ( $x=6.69\pm1.23$ ).

Tray Packs stored at 70°F were more acceptable ( $\bar{x}=6.80\pm1.54$ ) after 12 months of storage than those stored at 100°F ( $\bar{x}=6.28\pm1.40$ ). This effect was significant such that  $F(1,292)=9.21$  ( $p<.003$ ).

#### Spaghetti and Meatballs

At 70°F, time had a significant effect on acceptability ratings ( $F(3,593)=3.91$ ,  $p<.009$ ). Mean ratings at 36 months ( $\bar{x}=6.41\pm1.51$ ) were significantly lower than those at 12 months ( $\bar{x}=6.84\pm1.02$ ) and 24 months ( $\bar{x}=6.84\pm1.02$ ).

At 100°F, there was no effect of time on ratings.

After 12 months of storage, ratings were not influenced by storage temperature.

#### Macaroni and Beef

The effect of time on acceptability of this Tray Pack was highly significant in the 70°F storage condition ( $F(3,588)=7.49$ ,  $p<.0001$ ). Ratings followed an inverted 'U' pattern such that ratings at 0 and 36 months were each significantly lower than ratings at 12 and 24 months.

In the 100°F condition, there was no effect of time on acceptability.



At the 12 month taste test, subjects rated the 70°F Tray Pack samples significantly higher ( $x=6.89\pm1.19$ ) than they rated the 100°F samples ( $x=6.15\pm1.59$ ). This effect was significant such that  $F(1,296)=20.57$  ( $p<.0001$ ).

#### Beef Swiss Steak

At 70°F, temperature had a significant effect on acceptability ratings ( $F(3,580)=5.20$ ,  $p<.002$ ). The lowest rating was at 12 months ( $x=5.64\pm1.96$ ) and differed significantly from ratings at 24 and 36 months.

At 100°F, the effect of temperature was significant such that ( $F(2,440)=8.73$ ,  $p<.0001$ ). Tray Pack acceptability was again lowest at 12 months ( $x=5.41\pm1.83$ ) and was significantly different from mean acceptability at 0 and 6 months.

There was no effect of temperature on acceptability at the 12 month taste test.

#### Meatballs and Cabbage

The effect of time on acceptability ratings of the Tray Packs was significant under 70°F storage conditions ( $F(3,580)=9.45$ ,  $p<.0001$ ).

At 100°F, time did not have an effect on acceptability of the product.

There was no difference between the mean ratings of the 70°F and 100°F Tray Packs at 12 months.

#### Frankfurters in Brine

Time did not have an effect on acceptability at 70°F.

At 100°F, the effect of time was significant ( $F(2,444)=3.17$ ,  $p<.043$ ) such that initial ratings ( $x=4.69\pm1.91$ ) were significantly lower than ratings at 12 months ( $x=5.20\pm1.71$ ).

There was no effect of temperature on acceptability ratings during the 12 month taste test.

#### Lasagna

In both temperature conditions, there was a significant effect of time on ratings of the Tray Pack samples. At 70°F, the effect was significant such that  $F(3,560)=6.46$  ( $p<.0001$ ). Acceptability increased over time.

At 100°F, acceptability decreased over time ( $F(2,420)=3.05$ ,  $p<.048$ ). Ratings at 12 months ( $x=5.99\pm1.53$ ) were significantly lower than those at 0 months ( $x=6.35\pm1.41$ ) and 6 months ( $x=6.33\pm1.24$ ).

After 12 months of storage, ratings for the Tray Pack samples stored in 70°F were significantly higher ( $x=6.54\pm1.29$ ) than those stored in 100°F ( $x=5.99\pm1.53$ ). This was significant such that  $F(1,280)=10.87$  ( $p<.001$ ).

TABLE 2  
BEEF HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Beef Stew

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.94                 | 1.05                 | 144      |
| 6 mo<br>100°F        | 6.66                 | 1.24                 | 136      |
| 12 mo<br>70°F        | 6.84                 | 1.23                 | 144      |
| 12 mo<br>100°F       | 6.74                 | 1.40                 | 144      |
| 24 mo<br>70°F        | 6.66                 | 1.22                 | 152      |
| 36 mo<br>70°F        | 6.90                 | 1.34                 | 152      |

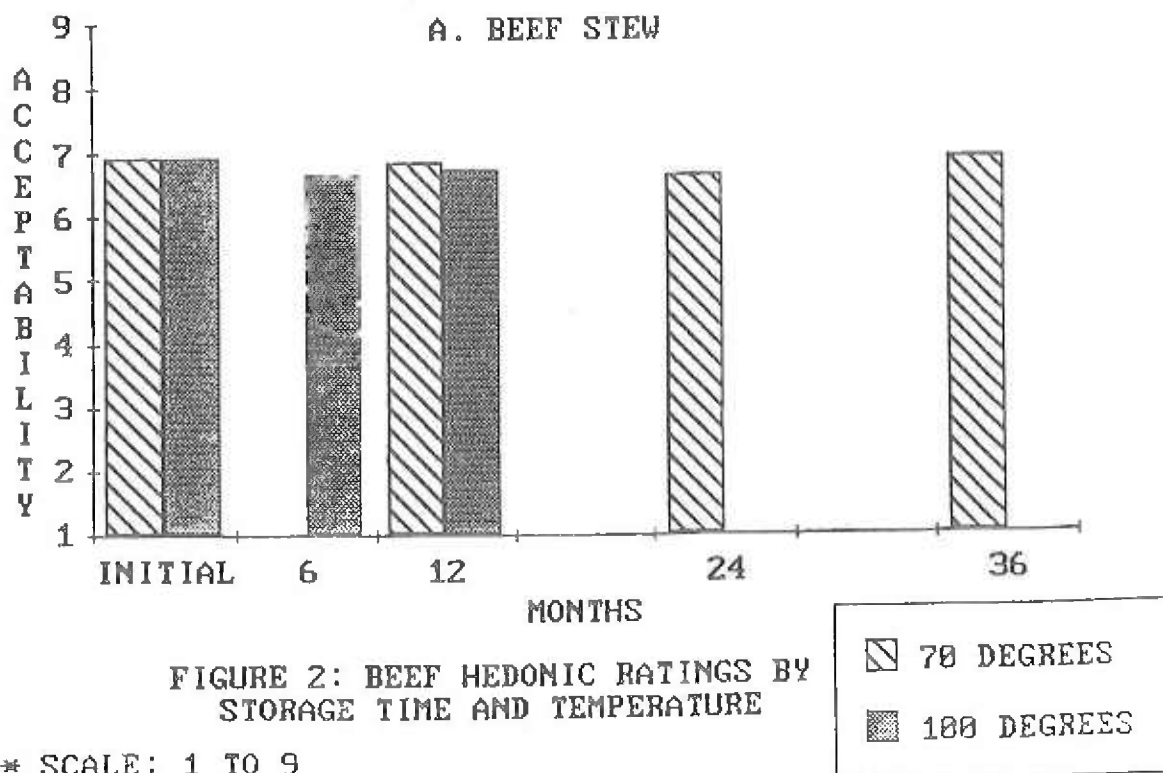


TABLE 2 (con'd)

B. Beef in BBQ Sauce

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.37                 | 1.40                 | 144      |
| 6 mo<br>100°F        | 6.15                 | 1.37                 | 144      |
| 12 mo<br>70°F        | 6.61                 | 1.55                 | 144      |
| 12 mo<br>100°F       | 6.14                 | 1.66                 | 144      |
| 24 mo<br>70°F        | 6.74                 | 1.64                 | 144      |
| 36 mo<br>70°F        | 5.91                 | 1.70                 | 152      |

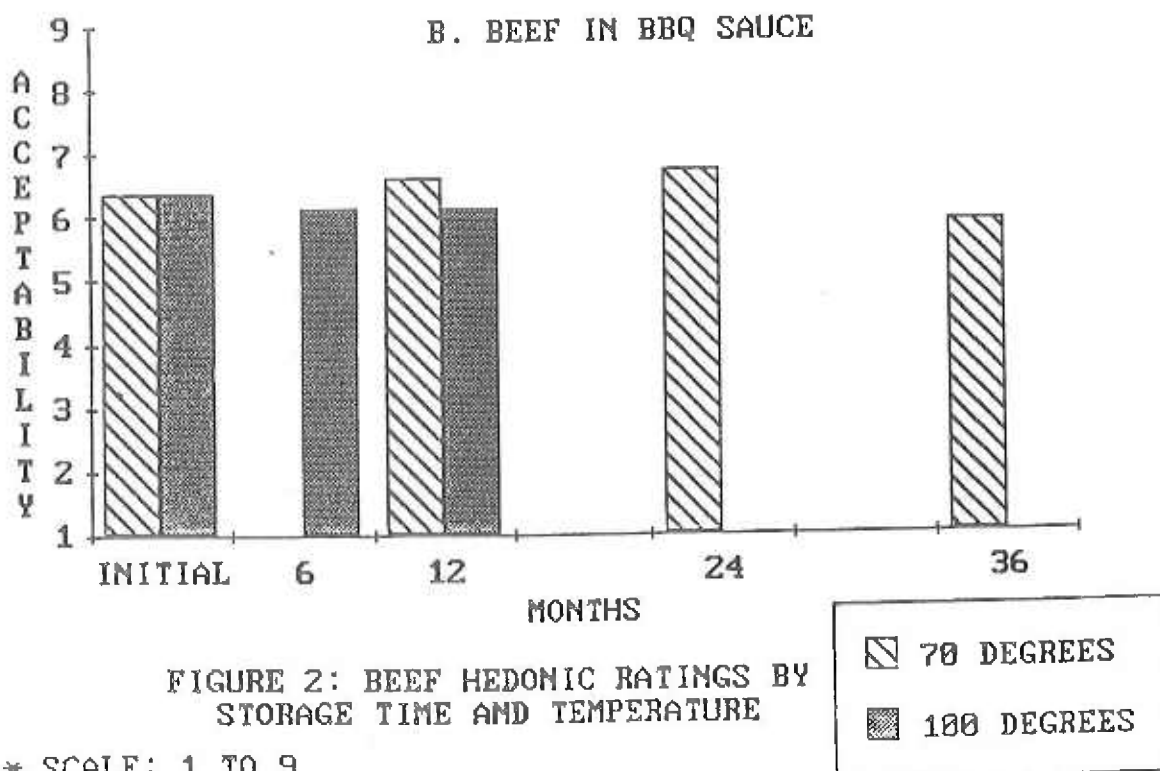


TABLE 2 (con'd)

C. Roast Beef in Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.99                 | 1.79                 | 160      |
| 6 mo<br>100°F        | 6.16                 | 1.69                 | 144      |
| 12 mo<br>70°F        | 6.35                 | 1.63                 | 144      |
| 12 mo<br>100°F       | 6.20                 | 1.68                 | 144      |
| 24 mo<br>70°F        | 6.20                 | 1.51                 | 152      |
| 36 mo<br>70°F        | 6.08                 | 1.49                 | 148      |

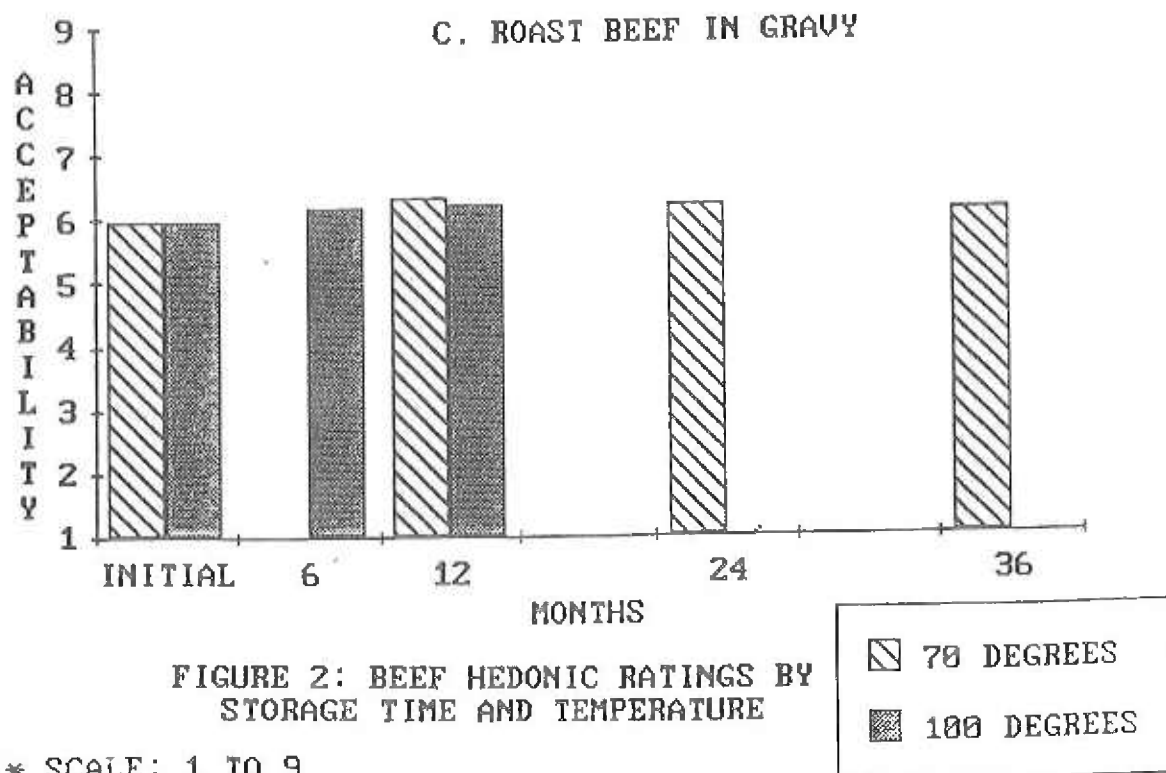


TABLE 2 (con'd)

D. Beef Pepper Steak

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.58                 | 1.41                 | 144      |
| 6 mo<br>100°F        | 6.52                 | 1.28                 | 144      |
| 12 mo<br>70°F        | 6.44                 | 1.57                 | 144      |
| 12 mo<br>100°F       | 6.53                 | 1.66                 | 144      |
| 24 mo<br>70°F        | 7.07                 | 1.55                 | 144      |
| 36 mo<br>70°F        | 6.73                 | 1.26                 | 148      |

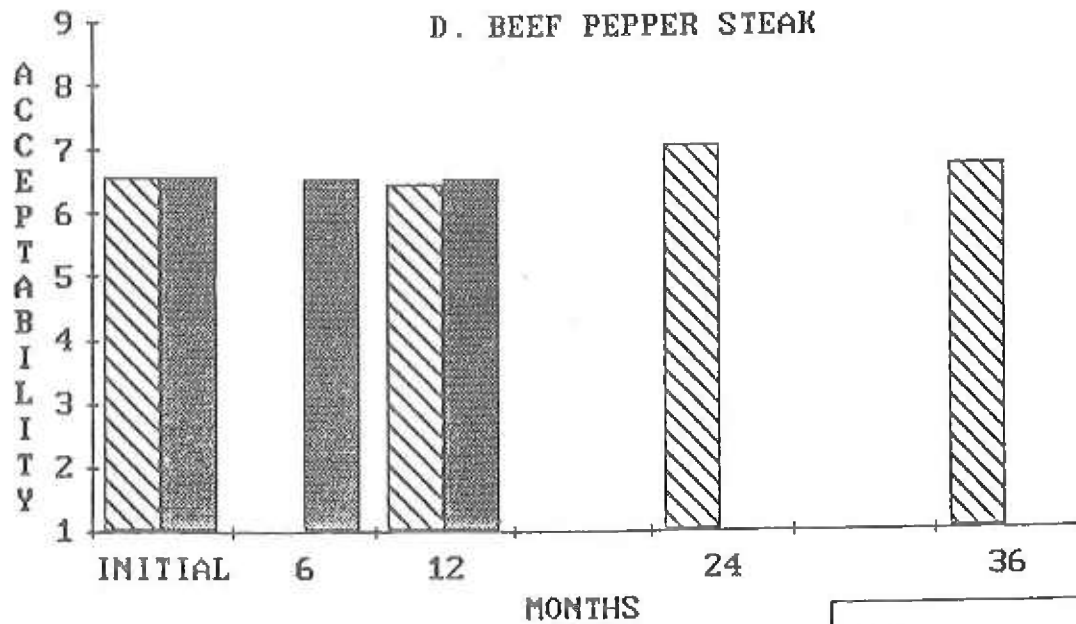


FIGURE 2: BEEF HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

\* SCALE: 1 TO 9



 70 DEGREES  
 100 DEGREES

TABLE 2 (con'd)

## E. Meatloaf in Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.69                 | 1.43                 | 144      |
| 6 mo<br>100°F        | 6.00                 | 1.71                 | 144      |
| 12 mo<br>70°F        | 6.36                 | 1.57                 | 152      |
| 12 mo<br>100°F       | 6.30                 | 1.49                 | 148      |
| 24 mo<br>70°F        | 6.50                 | 1.37                 | 152      |
| 36 mo<br>70°F        | 6.49                 | 1.28                 | 148      |

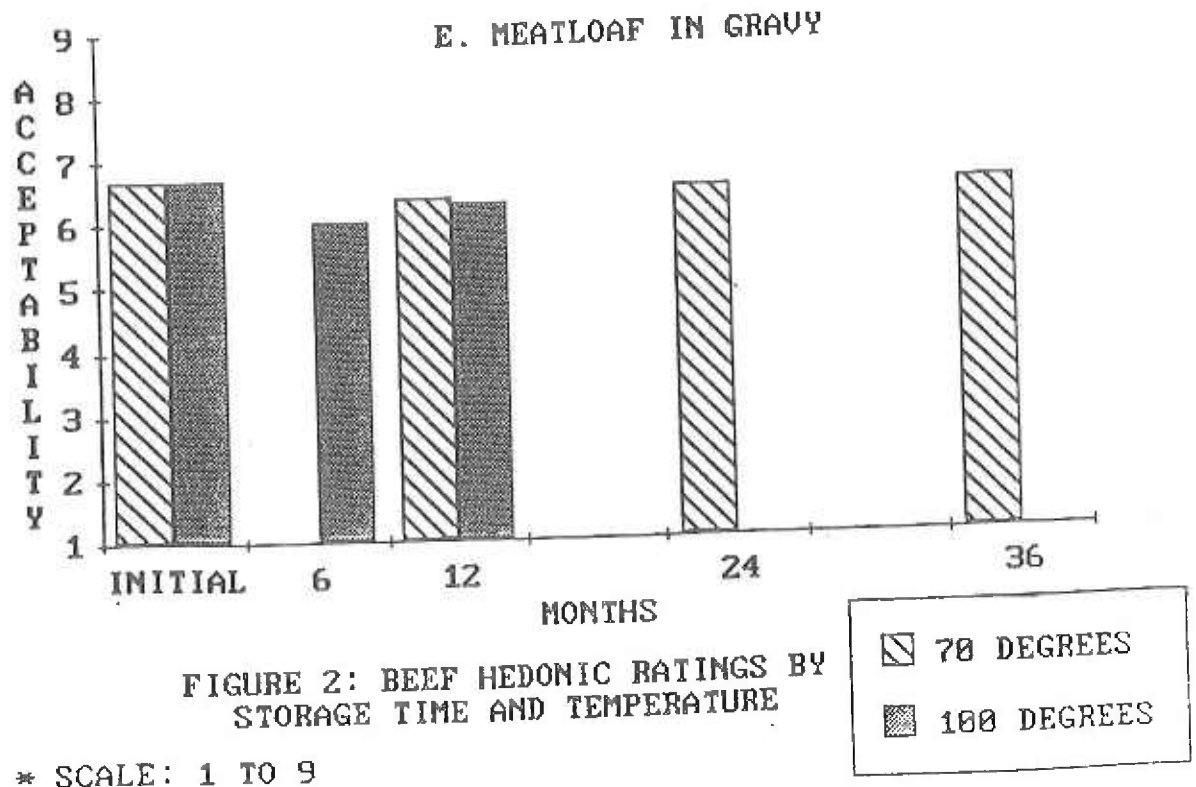


TABLE 2 (con'd)

F. Creamed Ground Beef

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.92                 | 1.62                 | 144      |
| 6 mo<br>100°F        | 5.99                 | 1.59                 | 144      |
| 12 mo<br>70°F        | 6.29                 | 1.67                 | 140      |
| 12 mo<br>100°F       | 5.74                 | 1.66                 | 152      |
| 24 mo<br>70°F        | 6.47                 | 1.30                 | 148      |
| 36 mo<br>70°F        | 6.27                 | 1.36                 | 152      |

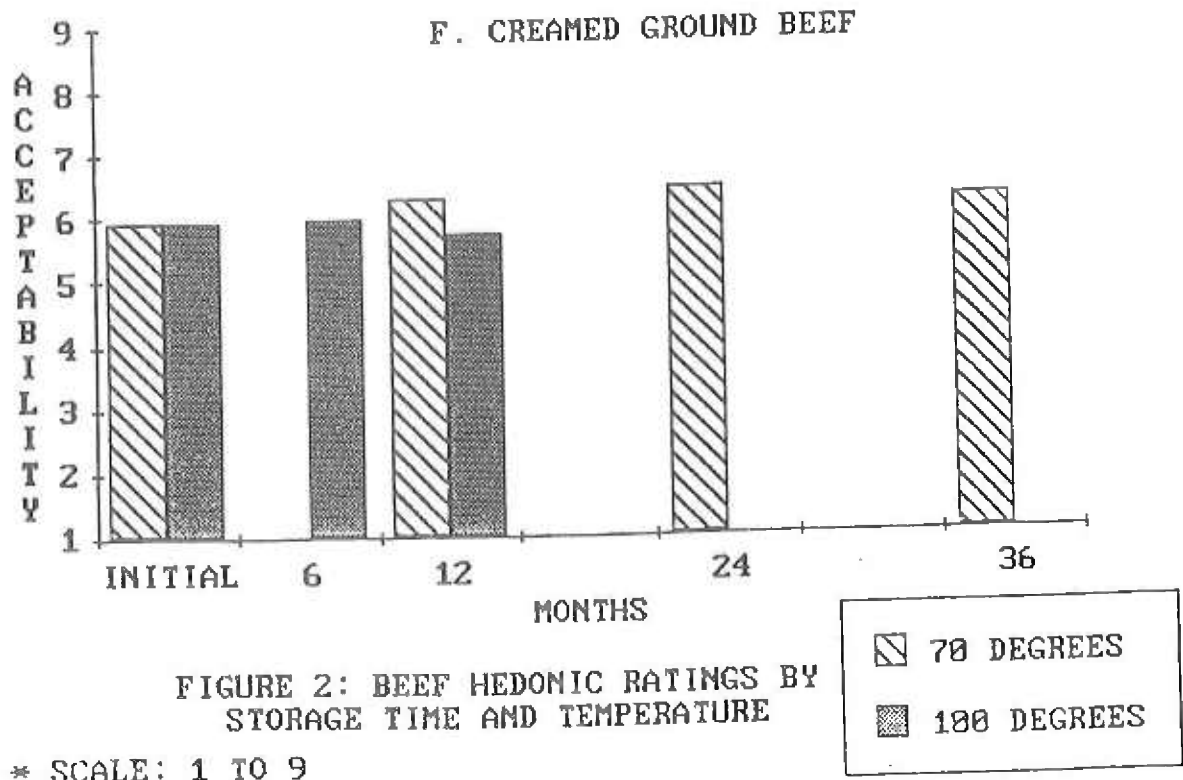




TABLE 2 (con'd)

G. Swedish Meatballs

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev</u> | <u>N</u> |
|----------------------|----------------------|---------------------|----------|
| 0 mo                 | 6.95                 | 1.28                | 152      |
| 6 mo<br>100°F        | 6.36                 | 1.47                | 152      |
| 12 mo<br>70°F        | 6.57                 | 1.46                | 152      |
| 12 mo<br>100°F       | 6.25                 | 1.86                | 152      |
| 24 mo<br>70°F        | 6.34                 | 1.67                | 152      |
| 36 mo<br>70°F        | 6.50                 | 1.52                | 152      |

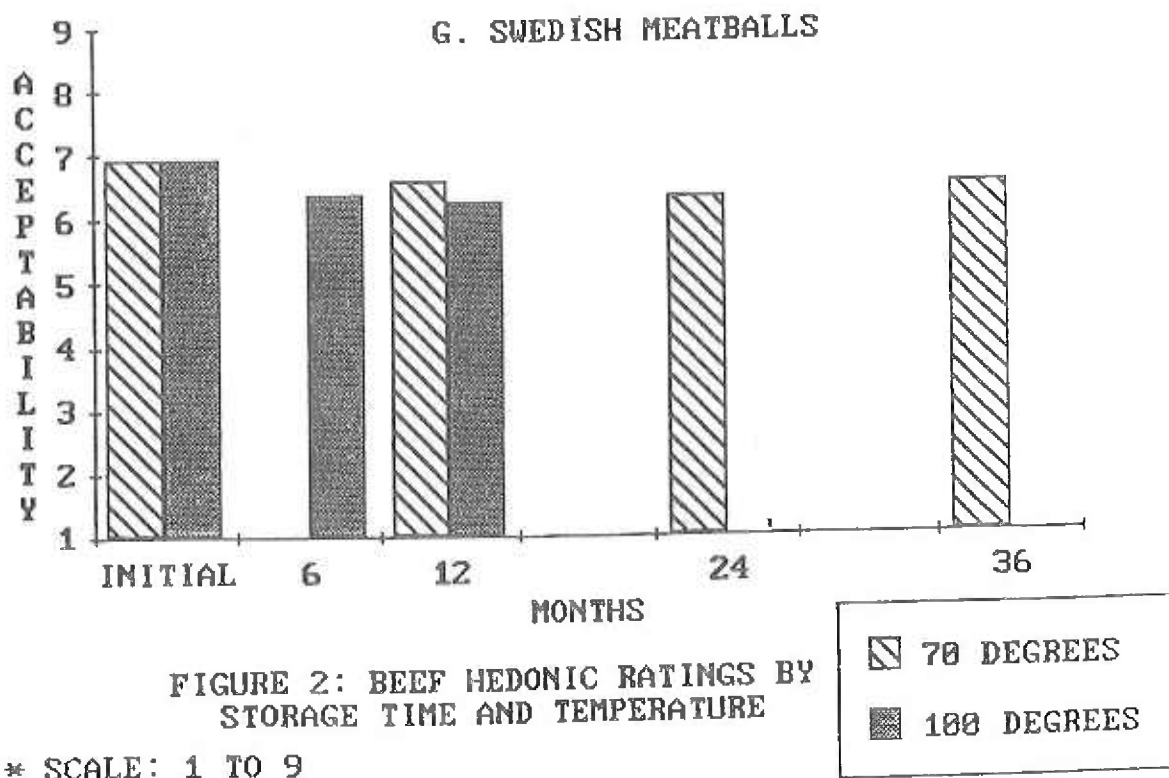


TABLE 2 (con'd)

H. Stuffed Peppers

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 7.02                 | 1.16                 | 144      |
| 6 mo<br>100°F        | 6.34                 | 1.55                 | 144      |
| 12 mo<br>70°F        | 6.84                 | 1.45                 | 152      |
| 12 mo<br>100°F       | 6.56                 | 1.19                 | 124      |
| 24 mo<br>70°F        | 6.59                 | 1.54                 | 152      |
| 36 mo<br>70°F        | 6.82                 | 1.19                 | 148      |

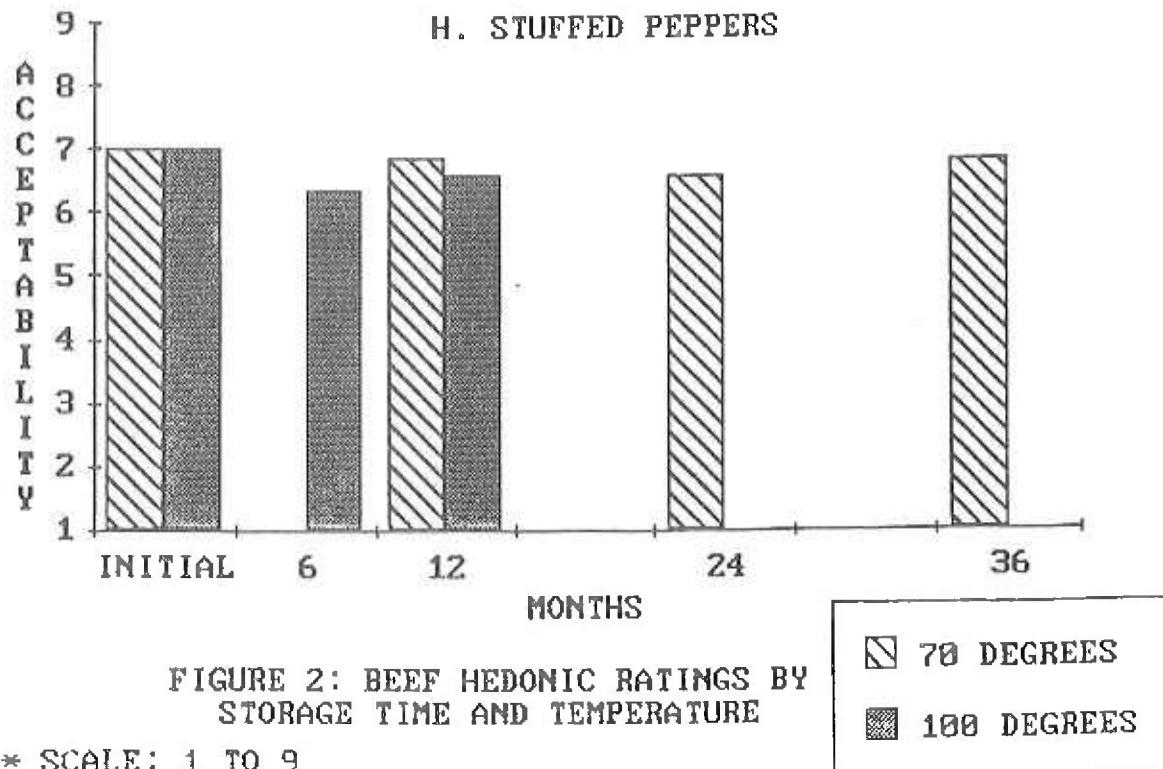


TABLE 2 (con'd)

I. Beef with Carrots

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.73                 | 1.39                 | 152      |
| 6 mo<br>100°F        | 6.24                 | 1.64                 | 144      |
| 12 mo<br>70°F        | 6.29                 | 1.56                 | 148      |
| 12 mo<br>100°F       | 6.20                 | 1.64                 | 152      |
| 24 mo<br>70°F        | 6.97                 | 1.40                 | 152      |
| 36 mo<br>70°F        | 6.71                 | 1.29                 | 144      |

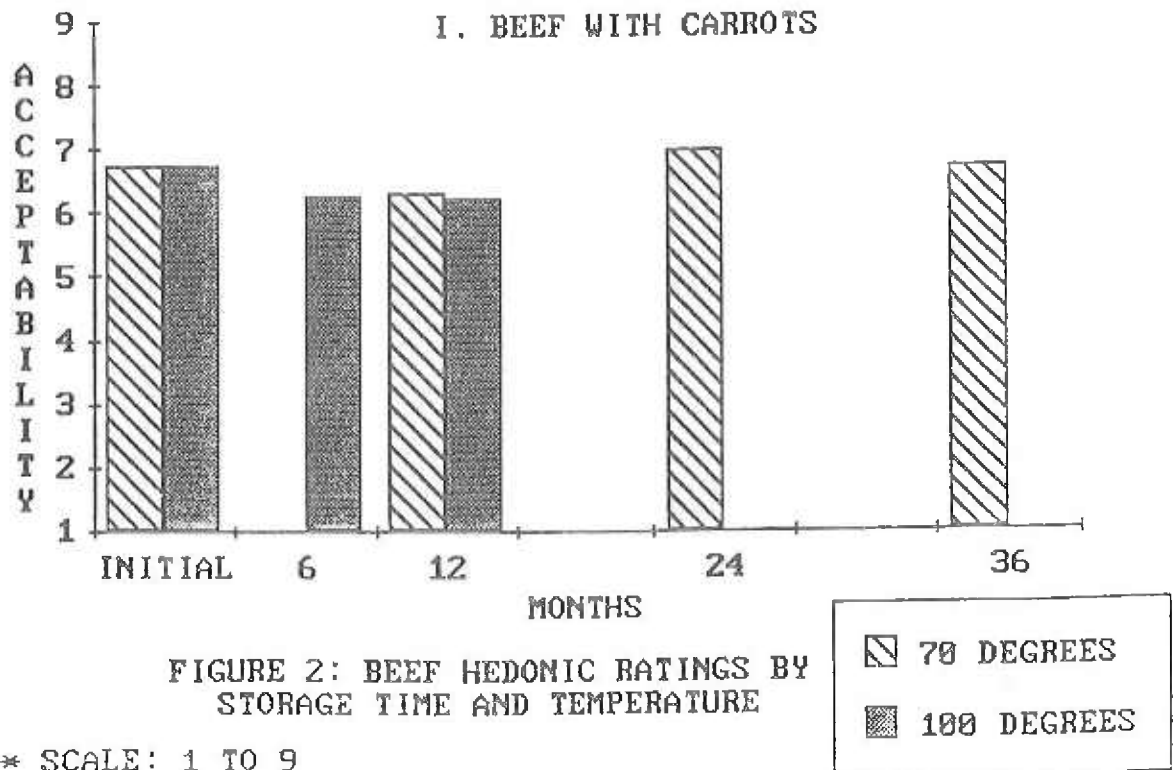


TABLE 2 (con'd)

J. Chili Con Carne

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.44                 | 1.53                 | 152      |
| 6 mo<br>100°F        | 7.16                 | 1.51                 | 152      |
| 12 mo<br>70°F        | 6.52                 | 1.67                 | 152      |
| 12 mo<br>100°F       | 6.76                 | 1.26                 | 144      |
| 24 mo<br>70°F        | 7.10                 | 1.07                 | 152      |
| 36 mo<br>70°F        | 6.99                 | 1.30                 | 152      |

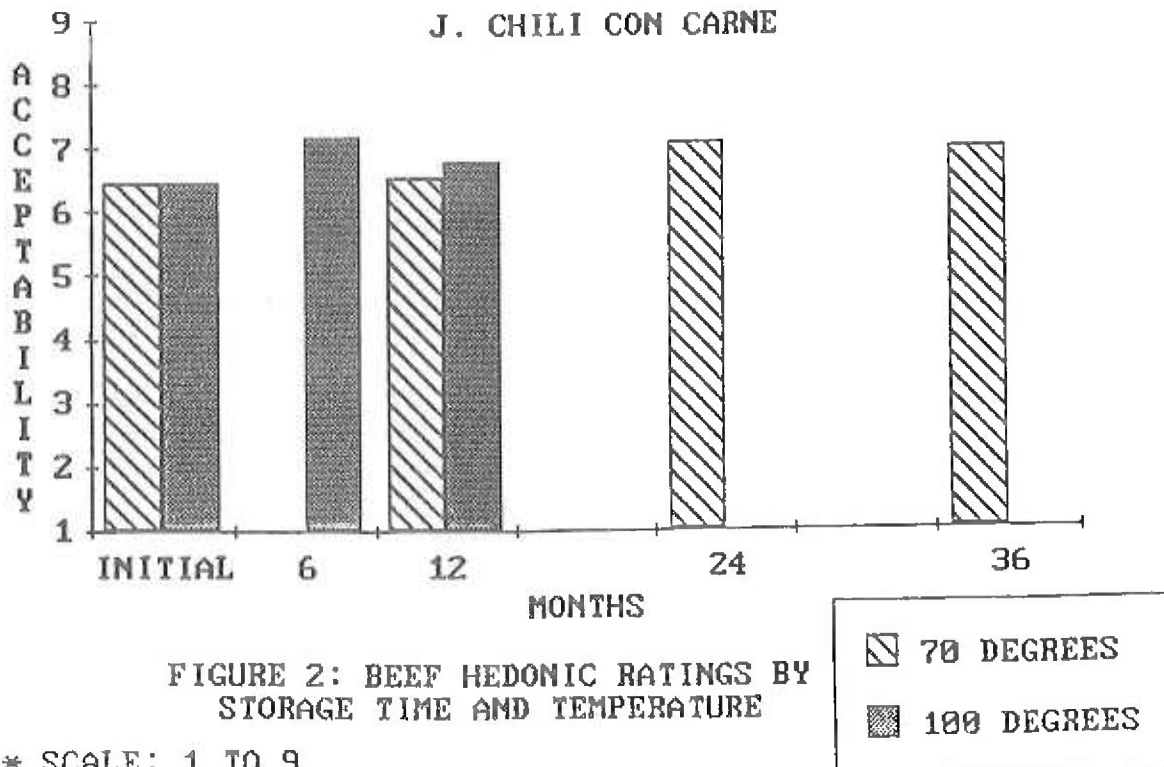


TABLE 2 (con'd)

K. Beef Tips with Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.92                 | 1.27                 | 152      |
| 6 mo<br>100°F        | 6.69                 | 1.23                 | 148      |
| 12 mo<br>70°F        | 6.80                 | 1.54                 | 152      |
| 12 mo<br>100°F       | 6.28                 | 1.40                 | 148      |
| 24 mo<br>70°F        | 6.39                 | 1.48                 | 152      |
| 36 mo<br>70°F        | 6.77                 | 1.20                 | 148      |

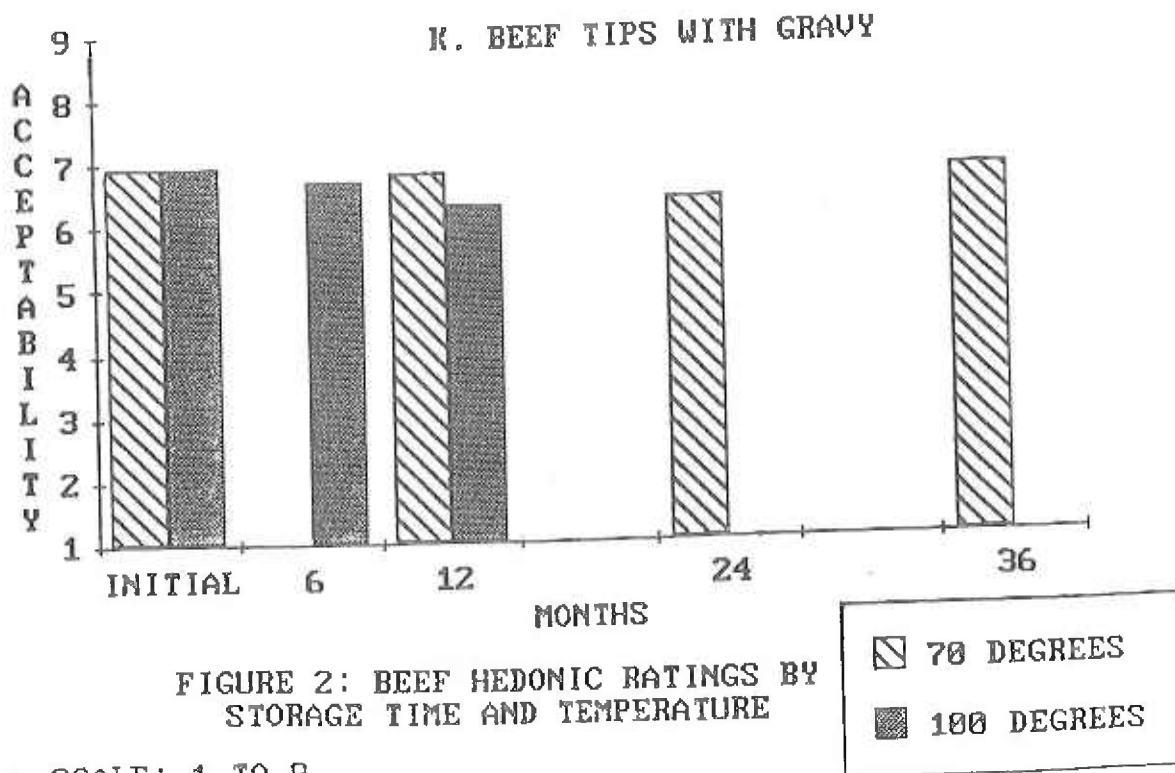
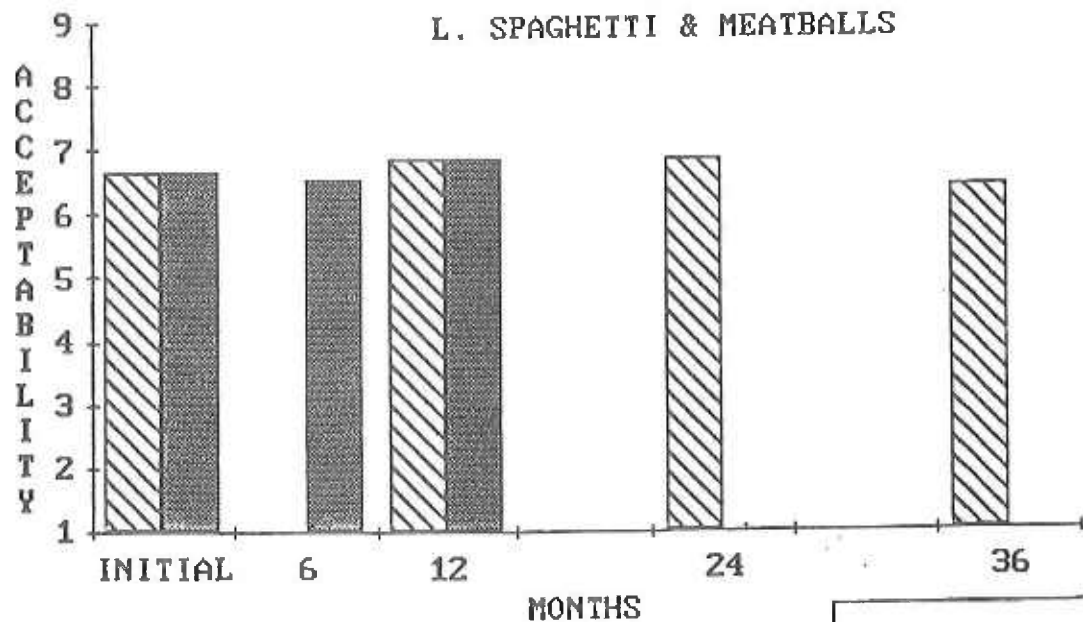


TABLE 2 (con'd)

L. Spaghetti & Meatballs

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.64                 | 1.45                 | 152      |
| 6 mo<br>100°F        | 6.54                 | 1.31                 | 140      |
| 12 mo<br>70°F        | 6.84                 | 1.02                 | 152      |
| 12 mo<br>100°F       | 6.84                 | .97                  | 152      |
| 24 mo<br>70°F        | 6.84                 | 1.02                 | 152      |
| 36 mo<br>70°F        | 6.41                 | 1.51                 | 152      |

FIGURE 2: BEEF HEDONIC RATINGS BY  
STORAGE TIME AND TEMPERATURE

\* SCALE: 1 TO 9

▨ 70 DEGREES  
■ 100 DEGREES

TABLE 2 (con'd)

## M. Macaroni and Beef

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.40                 | 1.31                 | 148      |
| 6 mo<br>100°F        | 6.31                 | 1.50                 | 152      |
| 12 mo<br>70°F        | 6.89                 | 1.19                 | 152      |
| 12 mo<br>100°F       | 6.15                 | 1.59                 | 152      |
| 24 mo<br>70°F        | 7.01                 | 1.26                 | 152      |
| 36 mo<br>70°F        | 6.59                 | 1.16                 | 152      |

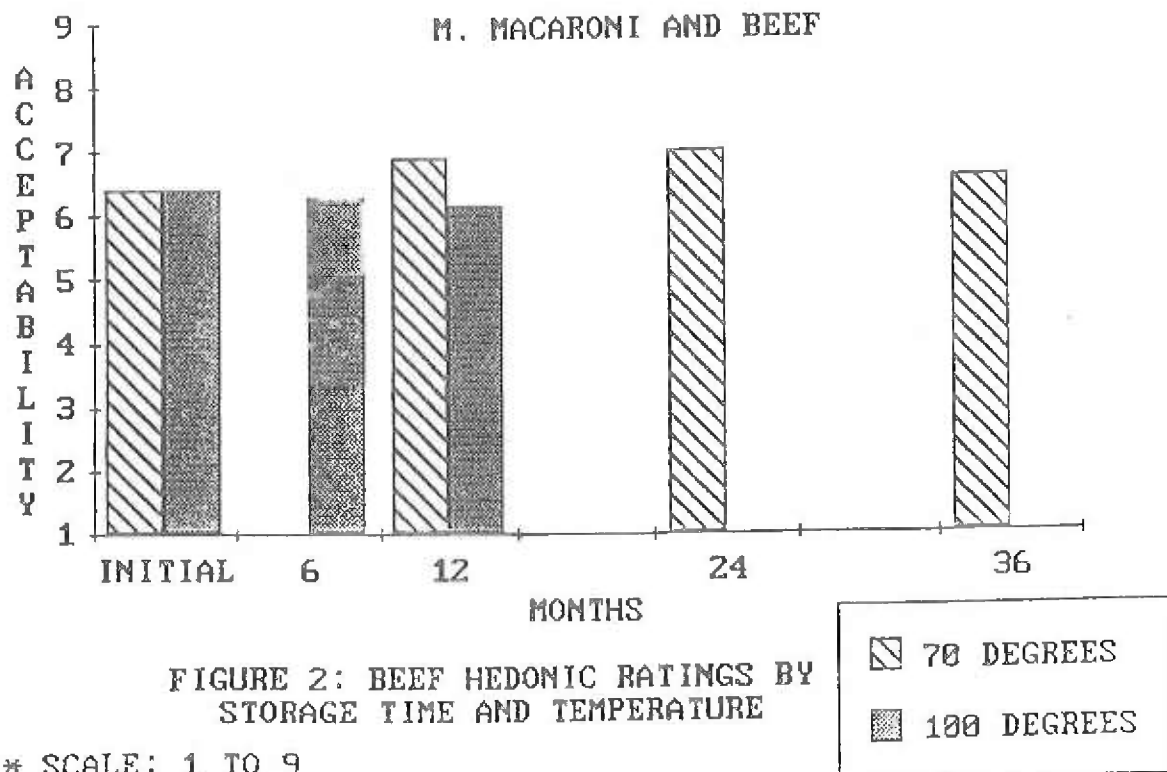


TABLE 2 (con'd)

N. Beef Swiss Steak

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.95                 | 1.59                 | 152      |
| 6 mo<br>100°F        | 6.18                 | 1.45                 | 152      |
| 12 mo<br>70°F        | 5.64                 | 1.96                 | 152      |
| 12 mo<br>100°F       | 5.41                 | 1.83                 | 148      |
| 24 mo<br>70°F        | 6.20                 | 1.50                 | 152      |
| 36 mo<br>70°F        | 6.31                 | 1.22                 | 140      |

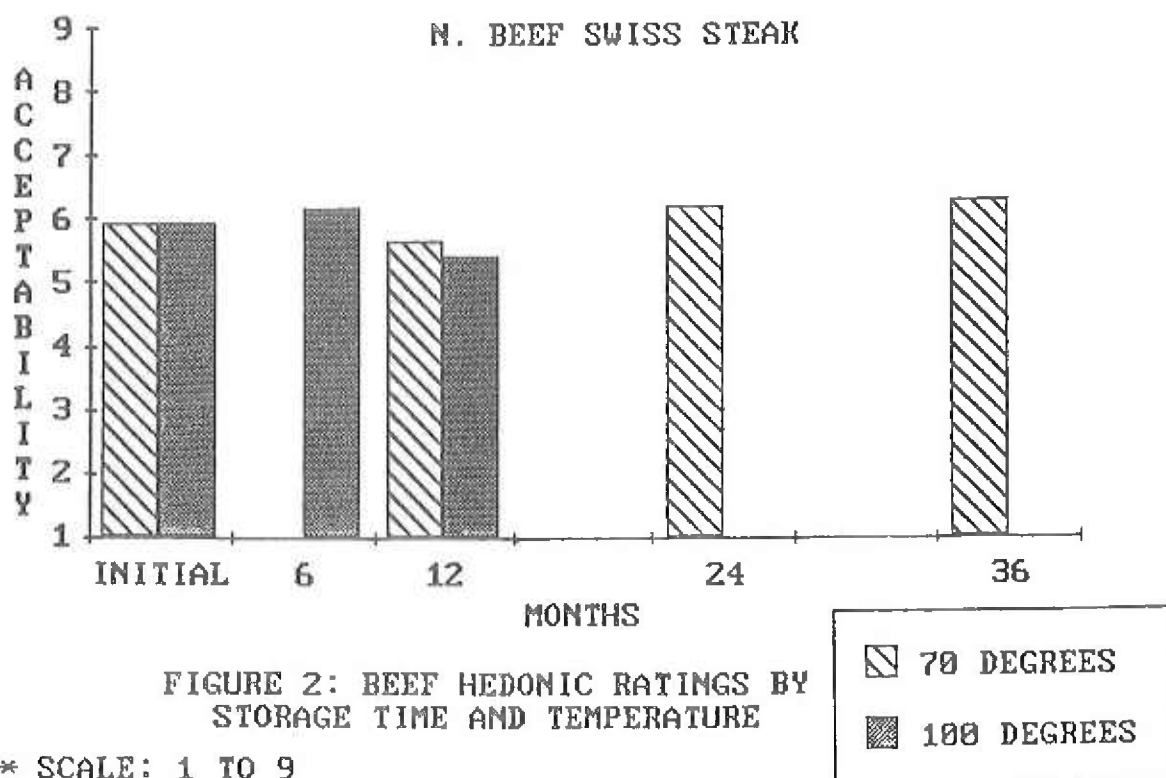




TABLE 2 (con'd)

O. Meatballs and Cabbage

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 7.21                 | 1.34                 | 140      |
| 6 mo<br>100°F        | 7.16                 | 1.06                 | 148      |
| 12 mo<br>70°F        | 7.11                 | 1.13                 | 152      |
| 12 mo<br>100°F       | 7.15                 | .97                  | 160      |
| 24 mo<br>70°F        | 7.45                 | .91                  | 152      |
| 36 mo<br>70°F        | 6.76                 | 1.16                 | 152      |

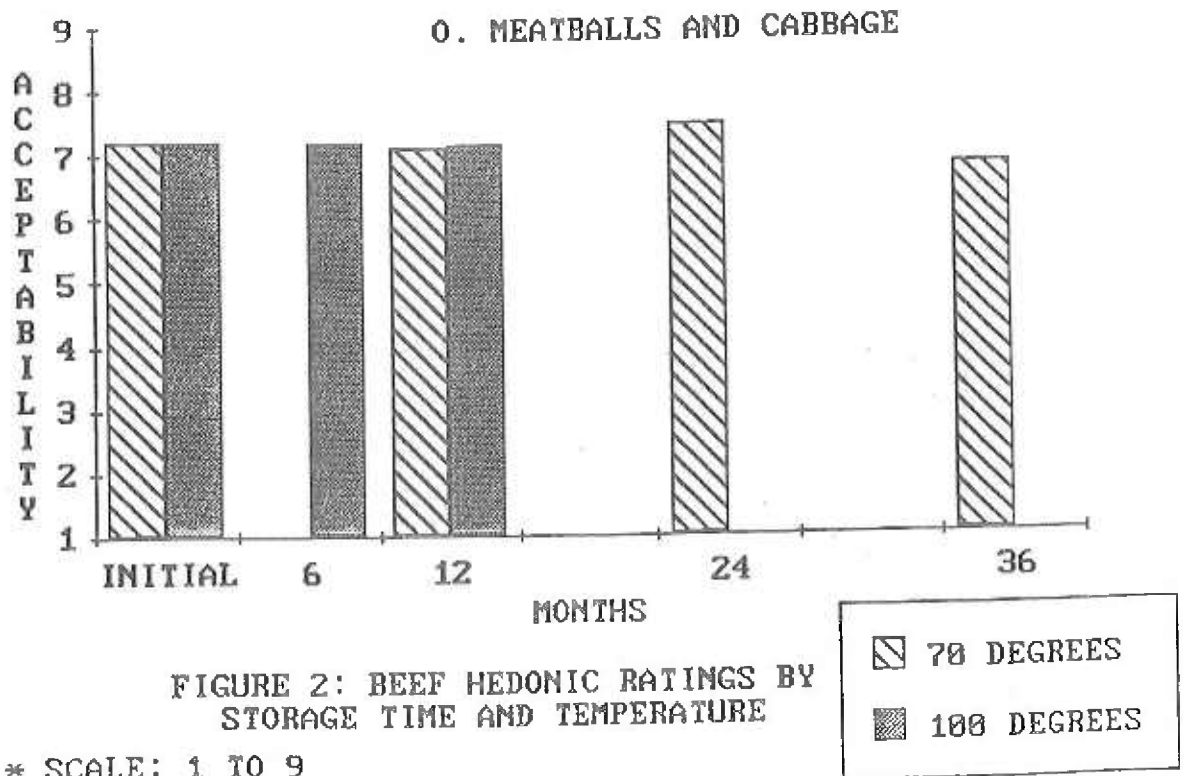


TABLE 2 (con'd)

P. Frankfurters in Brine

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 4.69                 | 1.91                 | 144      |
| 6 mo<br>100°F        | 5.09                 | 1.76                 | 160      |
| 12 mo<br>70°F        | 5.24                 | 2.01                 | 152      |
| 12 mo<br>100°F       | 5.20                 | 1.71                 | 152      |
| 24 mo<br>70°F        | 5.02                 | 1.82                 | 152      |
| 36 mo<br>70°F        | 5.09                 | 1.60                 | 152      |

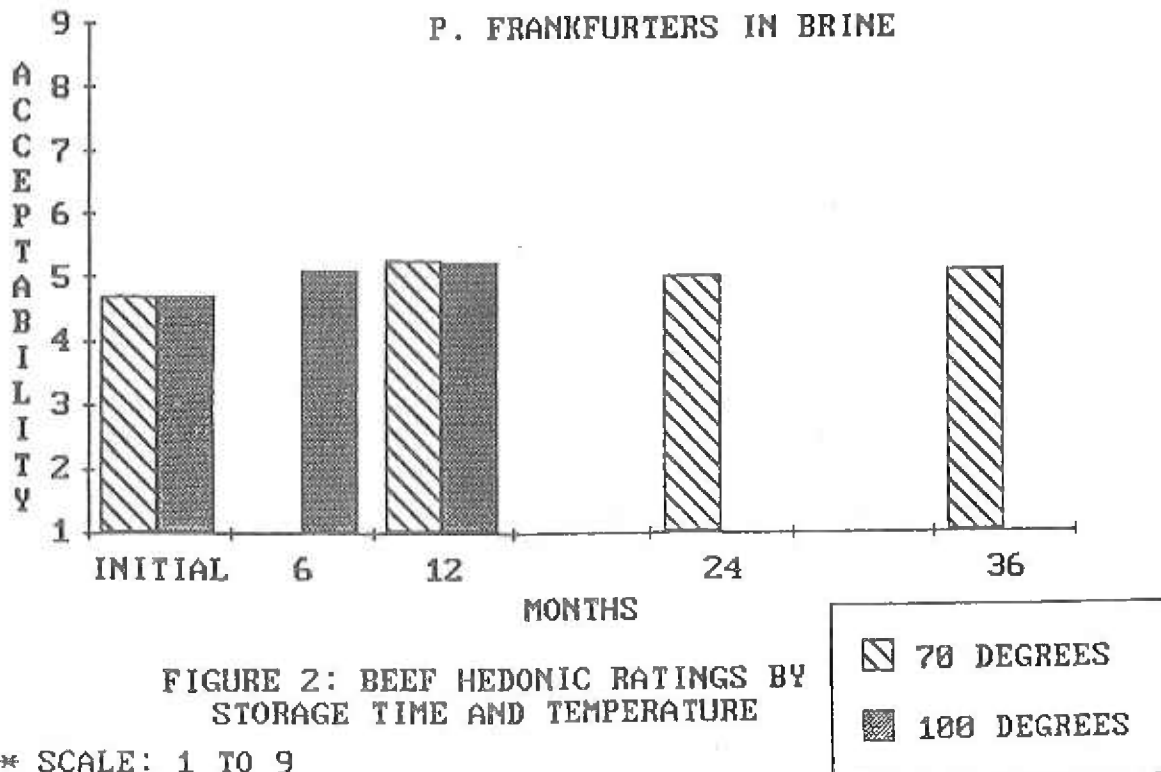
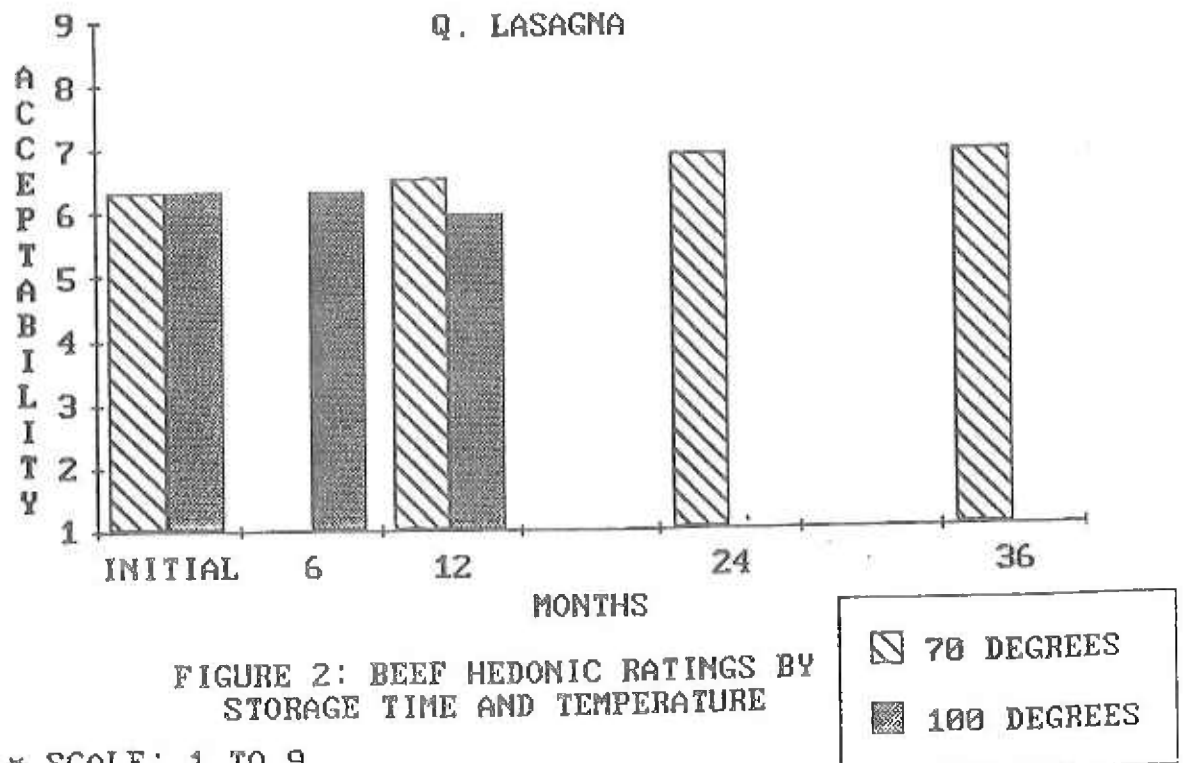


TABLE 2 (con'd)

Q. Lasagna

| <u>Storage/Temp.</u> | <u>Mean Ratings</u> * | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|-----------------------|----------------------|----------|
| 0 mo                 | 6.35                  | 1.41                 | 144      |
| 6 mo<br>100°F        | 6.33                  | 1.24                 | 144      |
| 12 mo<br>70°F        | 6.54                  | 1.29                 | 144      |
| 12 mo<br>100°F       | 5.99                  | 1.53                 | 144      |
| 24 mo<br>70°F        | 6.88                  | 1.32                 | 144      |
| 36 mo<br>70°F        | 6.89                  | .92                  | 144      |



### 3. PORK PRODUCTS

#### Pork Slices with Gravy

F-tests showed no significant effect of time on the acceptability of these Tray Packs stored at 70°F.

At 100°F, time did have a significant effect on acceptability ( $F(2,416)=4.81$ ,  $p<.009$ ). Post hoc tests revealed a significant decrease from the mean acceptability rating at 6 months ( $x=6.57\pm1.42$ ) to the one at 12 months ( $x=5.94\pm1.72$ ).

At 12 months, tests showed that temperature had a significant effect on acceptability ( $F(1,280)=9.41$ ,  $p<.002$ ). The mean rating of the 70°F Tray Packs was significantly higher ( $x=6.53\pm1.47$ ) than the mean rating of the 100°F Tray Packs ( $x=5.94\pm1.72$ ).

#### Canadian Bacon

At 70°F, the effect of time on acceptability was not significant.

At 100°F, the effect of time was significant ( $F(2,420)=7.03$ ,  $p<.001$ ). Post hoc tests showed that the initial mean ( $x=6.88\pm1.42$ ) was significantly higher than the 6 month ( $x=6.46\pm1.56$ ) and 12 month means ( $x=6.22\pm1.52$ ).

At 12 months, F-tests showed that temperature had a significant effect on ratings ( $F(1,280)=19.69$ ,  $p<.0001$ ). The mean rating of the Tray Packs stored at 70°F ( $x=6.94\pm1.23$ ) was significantly higher than the mean of those stored at 100°F ( $x=6.22\pm1.52$ ).

#### Ham Slices

At 70°F, there was a significant main effect of time on acceptability ( $F(3,580)=2.94$ ,  $p<.033$ ). The mean rating at 0 months ( $x=6.84\pm1.41$ ) was significantly higher than the one at 24 months ( $x=6.35\pm1.51$ ).

Time also had a significant effect on the ratings of Tray Packs stored at 100°F ( $F(2,428)=3.99$ ,  $p<.019$ ). The initial mean ( $6.84\pm1.41$ ) was significantly higher than the 6 month ( $6.43\pm1.53$ ) and 12 month ( $6.43\pm1.37$ ) means.

At 12 months, temperature did not have a significant effect on the acceptability of this Tray Pack.

#### Pork Sausage Links

With the Tray Packs stored at 70°F, tests showed that time had a significant effect on ratings ( $F(3,584)=8.36$ ,  $p<.0001$ ).

Time did not have a significant effect on the acceptability of the Tray Packs stored at 100°F.

At 12 months, storage temperature did not significantly affect ratings of this Tray Pack.

#### Pork with BBQ Sauce

This product was developed late so that it has completed only the 24 month storage withdrawal. Up to 24 months, there was a significant effect of time on acceptability ( $F(2,440)=6.25$ ,  $p<.002$ ) at 70°F. Ratings were significantly higher at 24 months ( $\bar{x}=7.14\pm1.39$ ) than they were at both 0 and 12 months.

There was no other significant finding with this Tray Pack.

TABLE 3  
PORK HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Pork Slices with Gravy

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.28                 | 1.91                 | 144      |
| 6 mo<br>100°F        | 6.57                 | 1.42                 | 140      |
| 12 mo<br>70°F        | 6.53                 | 1.47                 | 144      |
| 12 mo<br>100°F       | 5.94                 | 1.72                 | 144      |
| 24 mo<br>70°F        | 6.11                 | 1.82                 | 132      |
| 36 mo<br>70°F        | 6.38                 | 1.71                 | 144      |

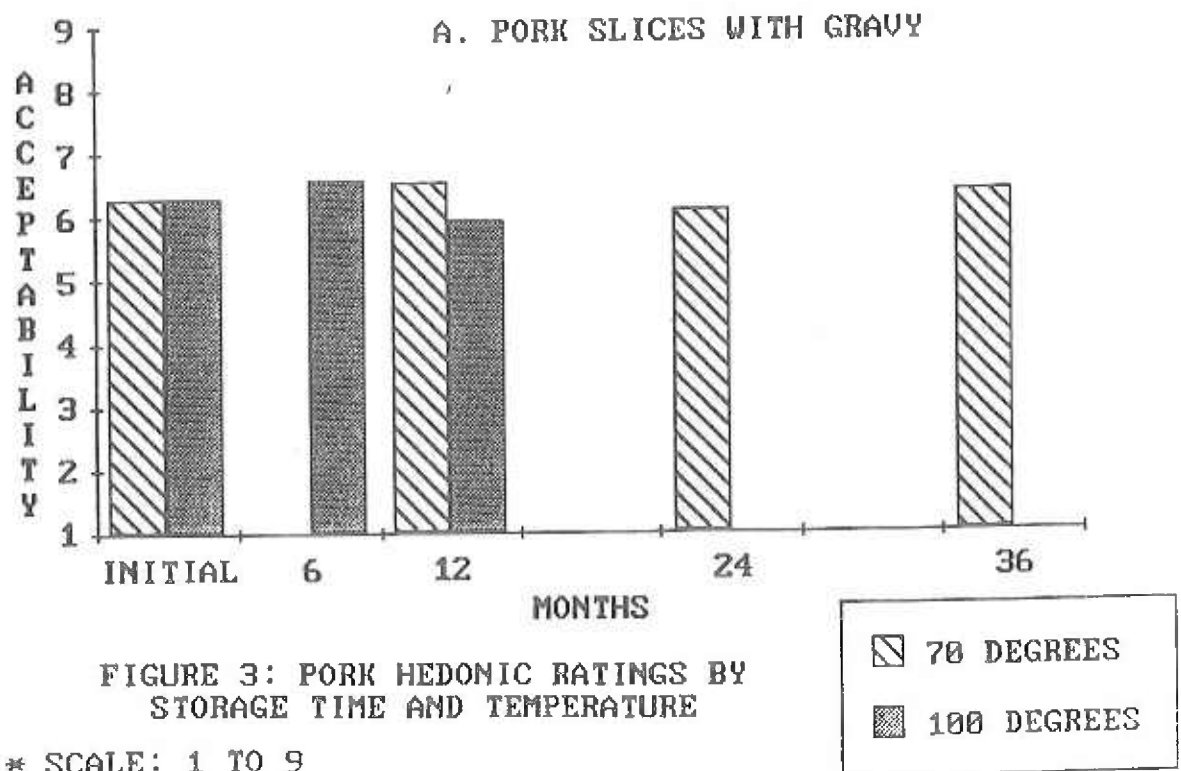


TABLE 3 (con'd)

B. Canadian Bacon

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.88                 | 1.42                 | 144      |
| 6 mo<br>100°F        | 6.46                 | 1.56                 | 144      |
| 12 mo<br>70°F        | 6.94                 | 1.23                 | 144      |
| 12 mo<br>100°F       | 6.22                 | 1.52                 | 144      |
| 24 mo<br>70°F        | 6.70                 | 1.33                 | 148      |
| 36 mo<br>70°F        | 6.95                 | 1.49                 | 152      |

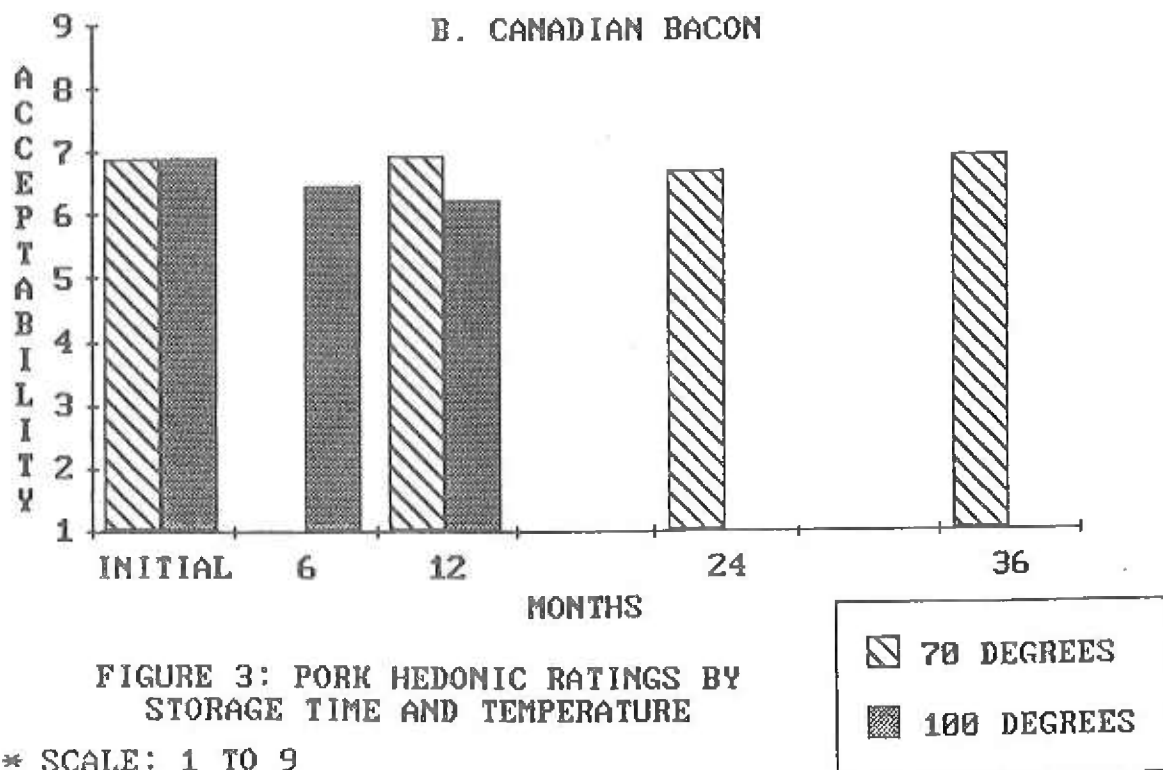




TABLE 3 (con'd)

C. Ham Slices

| <u>Storage/Temp.</u> | <u>Mean Ratings</u> * | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|-----------------------|----------------------|----------|
| 0 mo                 | 6.84                  | 1.41                 | 160      |
| 6 mo<br>100°F        | 6.43                  | 1.53                 | 136      |
| 12 mo<br>70°F        | 6.63                  | 1.34                 | 144      |
| 12 mo<br>100°F       | 6.43                  | 1.37                 | 144      |
| 24 mo<br>70°F        | 6.35                  | 1.51                 | 148      |
| 36 mo<br>70°F        | 6.63                  | 1.49                 | 144      |

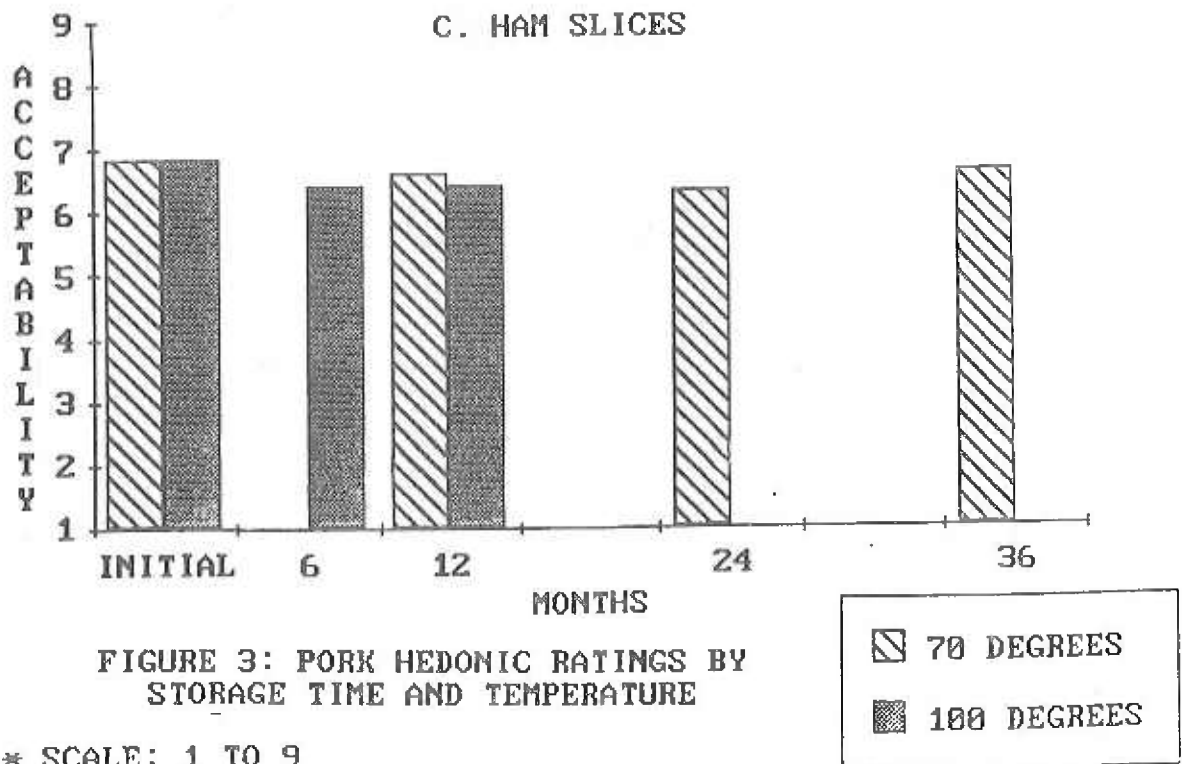


TABLE 3 (con'd)

D. Pork Sausage Links

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.22                 | 1.49                 | 144      |
| 6 mo<br>100°F        | 5.92                 | 1.76                 | 144      |
| 12 mo<br>70°F        | 5.79                 | 1.91                 | 152      |
| 12 mo<br>100°F       | 5.76                 | 1.71                 | 140      |
| 24 mo<br>70°F        | 5.57                 | 1.79                 | 152      |
| 36 mo<br>70°F        | 6.45                 | 1.50                 | 152      |

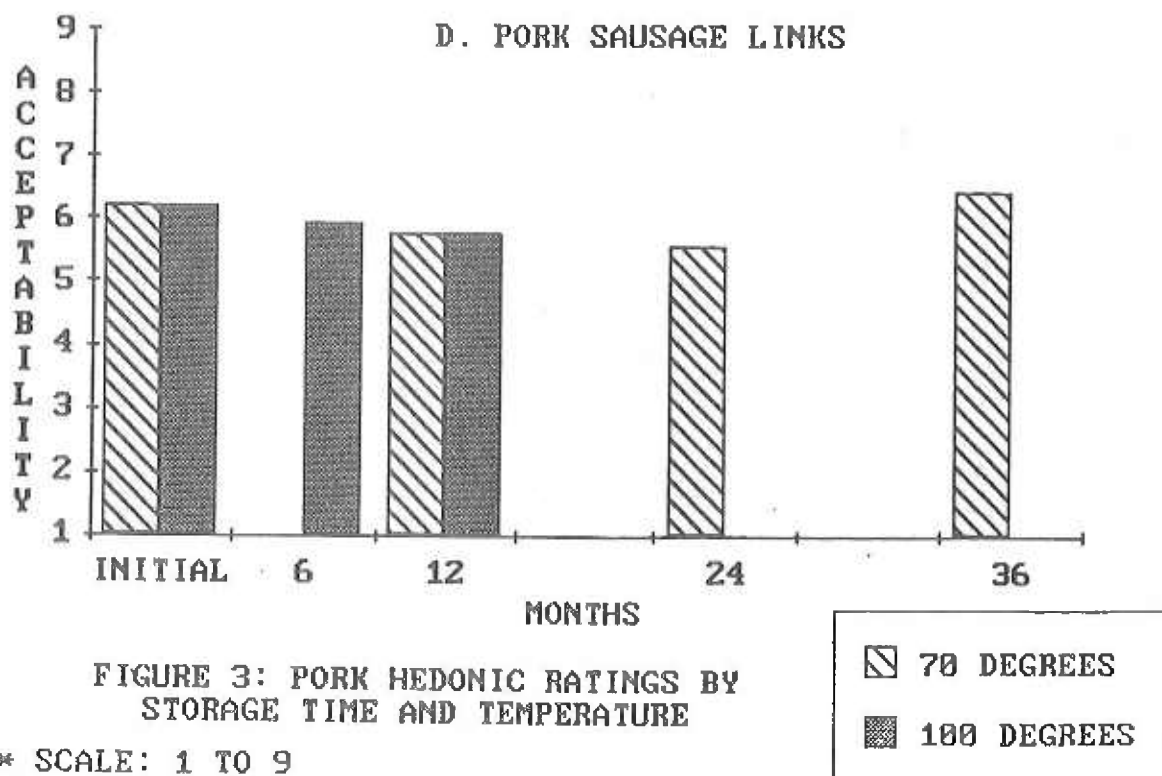
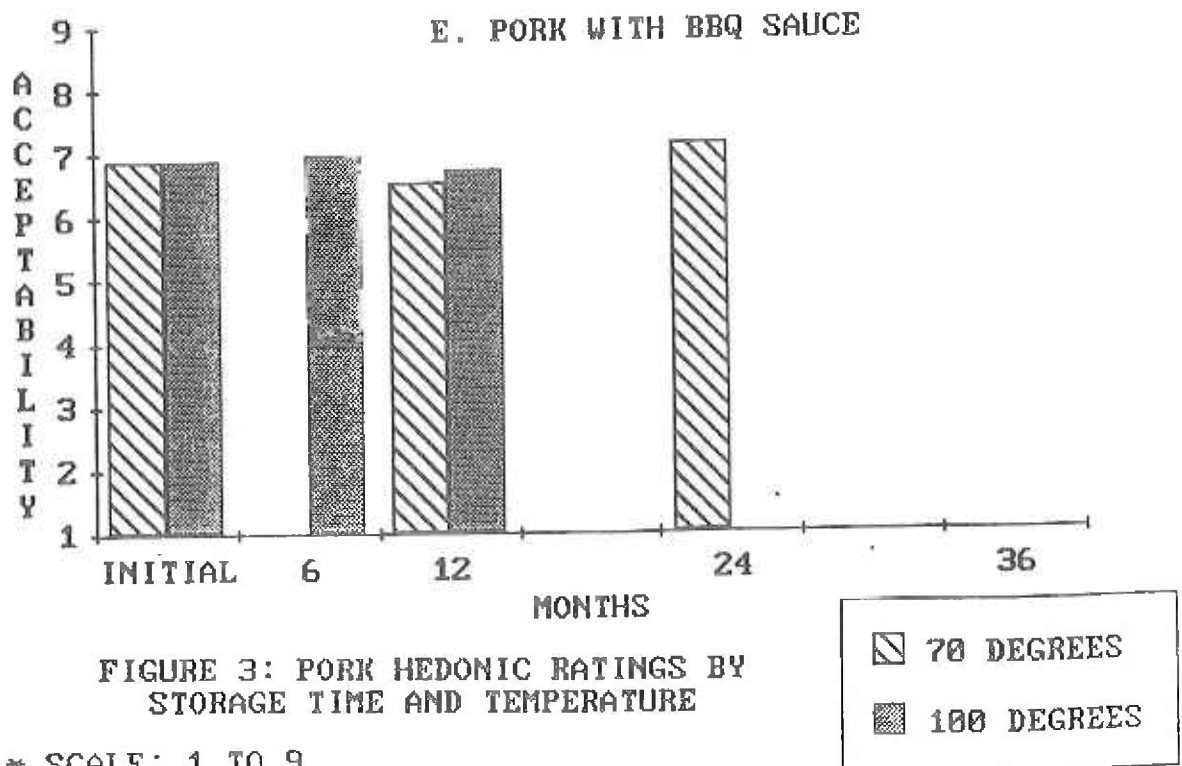


TABLE 3 (con'd)

E. Pork with BBQ Sauce

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.89                 | 1.39                 | 148      |
| 6 mo<br>100°F        | 6.97                 | 1.18                 | 152      |
| 12 mo<br>70°F        | 6.55                 | 1.53                 | 152      |
| 12 mo<br>100°F       | 6.72                 | 1.51                 | 148      |
| 24 mo<br>70°F        | 7.14                 | 1.39                 | 152      |



#### 4. VEGETABLE PRODUCTS

##### Mixed Vegetables

There was no effect of time on acceptability at 70°F.

At 100°F, time did have a significant effect on acceptability ratings ( $F(2,420)=3.98$ ,  $p<.019$ ). Ratings decreased significantly from 0 months ( $\bar{x}=5.85\pm1.99$ ) to 6 months ( $\bar{x}=5.3\pm1.77$ ), then increased significantly back to  $\bar{x}=5.78(\pm1.61)$  at 12 months.

At 12 months, storage temperature had no significant effect on acceptance ratings.

##### Peas & Mushrooms

Time had a significant effect on the acceptability rating of Tray Packs stored both at 70°F ( $F(3,580)=2.89$ ,  $p<.035$ ) and at 100°F ( $F(2,428)=4.70$ ,  $p<.01$ ). With the 70°F stored packs, the 36 month rating ( $\bar{x}=6.07\pm1.85$ ) was significantly lower than the 12 month rating ( $\bar{x}=6.53\pm1.57$ ).

With the 100°F stored packs, the 6 month rating ( $\bar{x}=6.57\pm1.32$ ) was significantly higher than both the initial rating ( $\bar{x}=6.13\pm1.64$ ) and the 12 month rating ( $\bar{x}=6.05\pm1.66$ ).

At 12 months, storage temperature showed a significant effect on acceptability ratings ( $F(1,288)=6.44$ ,  $p<.012$ ). The mean rating of the Tray Packs stored at 70°F was significantly higher ( $x=6.53\pm1.57$ ) than that of the packs stored at 100°F ( $x=6.05\pm1.66$ ).

#### Whole Kernel Corn

In the 70°F storage condition, acceptability was significantly affected by time ( $F(3,580)=3.27$ ,  $p<.021$ ) such that at 12 months the mean rating ( $x=6.64\pm1.32$ ) was significantly higher than the rating at 0 months ( $x=6.25\pm1.3$ ) and 36 months ( $x=6.20\pm1.29$ ).

Time also had a significant effect on ratings of the 100°F stored Tray Packs ( $F(2,428)=3.67$ ,  $p<.026$ ). Ratings dropped significantly from 0 months ( $x=6.25\pm1.30$ ) to 6 months ( $x=5.86\pm1.70$ ), then increased significantly at 12 months to  $x=6.29(\pm1.41)$ .

Storage temperature had a significant effect on ratings at 12 months ( $F(1,296)=5.10$ ,  $p<.025$ ). The Tray Packs that had been stored at 70°F ( $x=6.64\pm1.32$ ) were rated significantly higher than those stored at 100°F ( $x=6.29\pm1.41$ ).

#### Glazed Carrots

Time had a significant effect on the ratings of Tray Packs stored at both temperature levels. At 70°F, ANOVA's showed that  $F(3,588)=8.82$  ( $p<.0001$ ) and 100°F,  $F(2,444)=9.14$  ( $p<.0001$ ).

At 70°F, the 12 month mean acceptability rating ( $\bar{x}=5.54\pm1.8$ ) was significantly lower than all other means. At 100°F, the 12 month rating ( $\bar{x}=5.41\pm1.84$ ) was also significantly lower than both of the other means.

At 12 months, storage temperature did not show any significant effect on ratings.

#### Sliced Carrots

Time had a significant effect on the acceptability of this Tray Pack at both 70°F ( $F(3,580)=3.11$ ,  $p<.026$ ) and 100°F ( $F(2,428)=14.31$ ,  $p<.0001$ ). At 70°F, the acceptability rating at 12 months ( $\bar{x}=5.19\pm1.91$ ) was significantly higher than the rating at 24 months ( $\bar{x}=4.59\pm1.75$ ).

At 100°F, the 12 month rating ( $\bar{x}=3.98\pm1.57$ ) was significantly lower than the means at both 0 and 6 months.

At 12 months, tests showed that temperature had a significant effect on acceptability ratings ( $F(1,296)=35.96$ ,  $p<.0001$ ). The mean of the 70°F stored packs was significantly higher than the mean of those stored at 100°F.

#### Creamed Corn

In the 70°F storage condition, the main effect of time was

significant ( $F(3,584)=3.74$ ,  $p<.011$ ). Post hoc tests showed that ratings at 12 months ( $\bar{x}=6.89\pm1.14$ ) were significantly higher than ratings at 36 months ( $\bar{x}=6.35\pm1.61$ ).

At 100°F, the effect of time on acceptability was also significant ( $F(2,428)=5.91$ ,  $p<.003$ ).

At 100°F, there was a significant interaction between time and sample ( $F(6,428)=4.58$ ,  $p<.0001$ ). The mean acceptability rating of sample 4 at 12 months was significantly lower than all other ratings. Nevertheless, because all samples were pulled from the same lot, only random chance would account for a difference in the taste of that particular sample. Thus, no conclusions will be drawn from these results.

At 12 months there was a main effect of temperature ( $F(1,284)=19.97$ ,  $p<.0001$ ). Acceptability ratings were significantly higher under 70°F storage conditions than they were under 100°F. In addition, a significant interaction effect between time and sample was found, although as previously stated, this effect is due to chance and will not influence conclusions.

#### Glazed Sweet Potatoes

There was a significant main effect of time on acceptability at 70°F ( $F(3,578)=3.96$ ,  $p<.008$ ). There was also a significant interaction effect between time and sample because one sample at one

time was exceptionally higher than all others. Again, no conclusion can be drawn from this instance since only by random chance would the samples taste differently.

At 100°F, there was also a significant effect of time on acceptability ( $F(2,438)=4.94$ ,  $p<.008$ ). Acceptability ratings decreased over time, such that the initial rating was significantly higher than the rating at 12 months.

At 12 months there was a significant main effect of temperature on acceptability ( $F(1,296)=26.96$ ,  $p<.0001$ ). The acceptability rating was higher at 70°F than at 100°F.

#### Green Beans

At 70°F, the effect of time on acceptability was highly significant ( $F(3,568)=15.01$ ,  $p<.0001$ ). Ratings decreased significantly from 0 months to each of 24 and 36 months and from 12 months to each of 24 and 36 months.

The effect of time on acceptability was also significant at 100°F ( $F(2,420)=8.44$ ,  $p<.0001$ ). Ratings decreased over time such that the mean rating at 0 months was significantly higher than ratings at both 6 and 12 months.

The effect of temperature on acceptability at 12 months of storage was significant ( $F(1,280)=37.03$ ,  $p<.0001$ ). Mean ratings



under 100°F ( $x=4.96\pm1.82$ ) were significantly lower than ratings at 70°F ( $x=6.20\pm1.61$ ).

#### Peas & Carrots

At 70°F, ratings of this Tray Pack were significantly affected by time ( $F(3,592)=3.11$ ,  $p<.026$ ). Post hoc tests showed that the 36 month mean was significantly lower than the 24 month mean.

At 100°F, time also had a significant effect on acceptability ( $F(2,444)=5.46$ ,  $p<.005$ ). Post hoc tests showed that the mean rating at 12 months ( $x=5.34\pm1.54$ ) was significantly lower than the initial mean ( $x=5.99\pm1.96$ ).

At 12 months, storage temperature had a significant effect on acceptability ratings ( $F(1,296)=16.34$ ,  $p<.0001$ ). The Tray Packs stored at 70°F were rated higher ( $x=6.09\pm1.72$ ) than those stored at 100°F ( $x=5.34\pm1.54$ ).

TABLE 4  
VEGETABLE HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Mixed Vegetables

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.85                 | 1.99                 | 144      |
| 6 mo<br>100°F        | 5.30                 | 1.77                 | 144      |
| 12 mo<br>70°F        | 5.56                 | 1.73                 | 144      |
| 12 mo<br>100°F       | 5.78                 | 1.61                 | 144      |
| 24 mo<br>70°F        | 5.42                 | 1.73                 | 144      |
| 36 mo<br>70°F        | 5.46                 | 1.74                 | 152      |

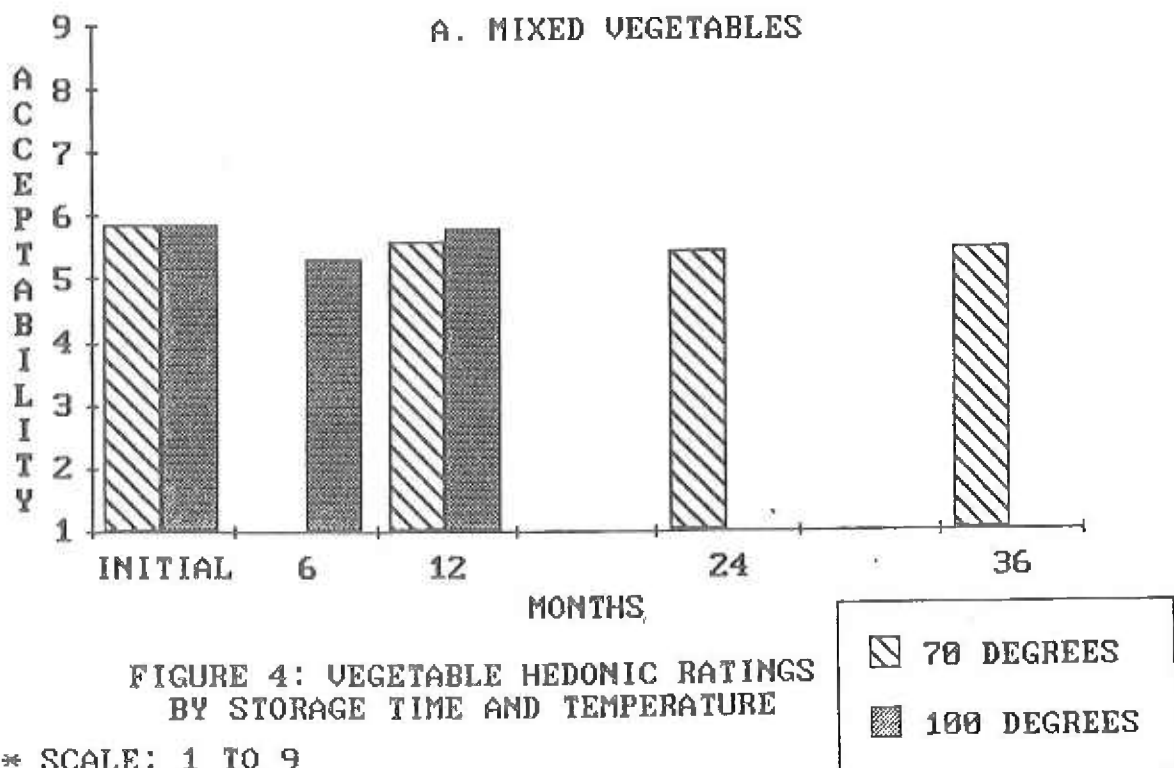


TABLE 4 (con'd)

B. Peas & Mushrooms

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.13                 | 1.64                 | 144      |
| 6 mo<br>100°F        | 6.57                 | 1.32                 | 148      |
| 12 mo<br>70°F        | 6.53                 | 1.57                 | 148      |
| 12 mo<br>100°F       | 6.05                 | 1.66                 | 148      |
| 24 mo<br>70°F        | 6.45                 | 1.53                 | 152      |
| 36 mo<br>70°F        | 6.07                 | 1.85                 | 152      |

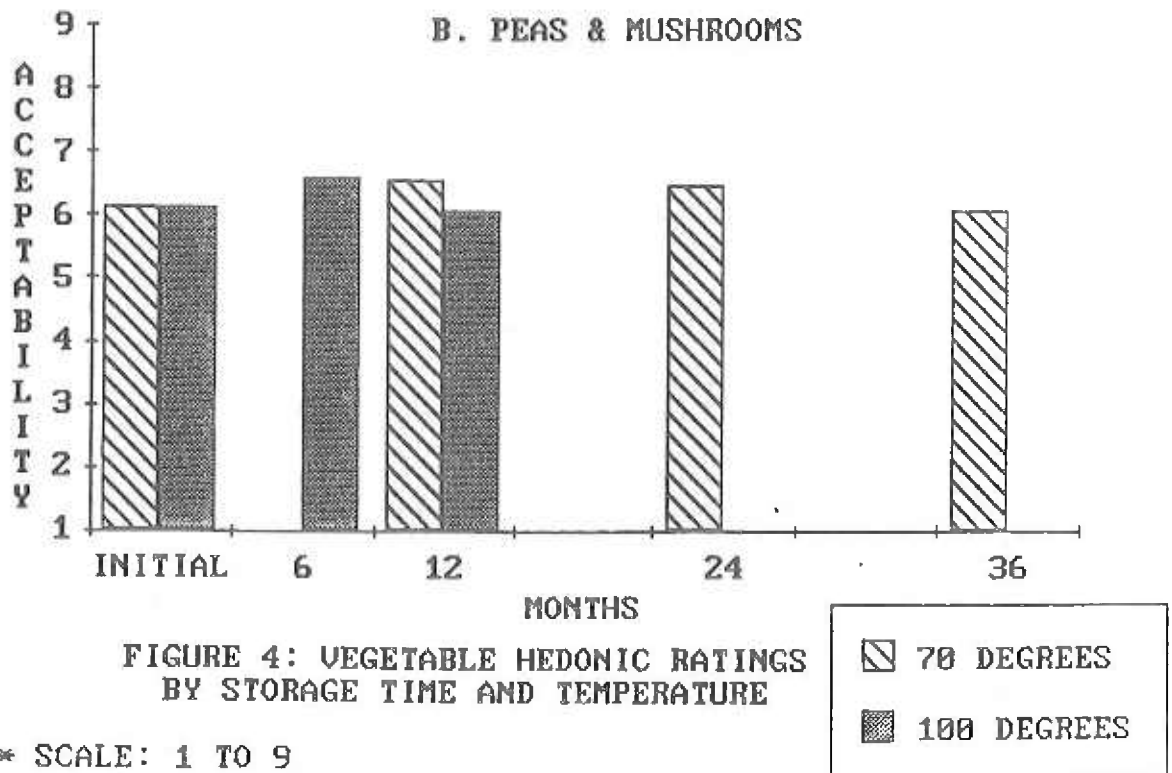


TABLE 4 (con'd)

C. Whole Kernel Corn

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.25                 | 1.30                 | 144      |
| 6 mo<br>100°F        | 5.86                 | 1.70                 | 144      |
| 12 mo<br>70°F        | 6.64                 | 1.32                 | 152      |
| 12 mo<br>100°F       | 6.29                 | 1.41                 | 152      |
| 24 mo<br>70°F        | 6.36                 | 1.48                 | 152      |
| 36 mo<br>70°F        | 6.20                 | 1.29                 | 148      |

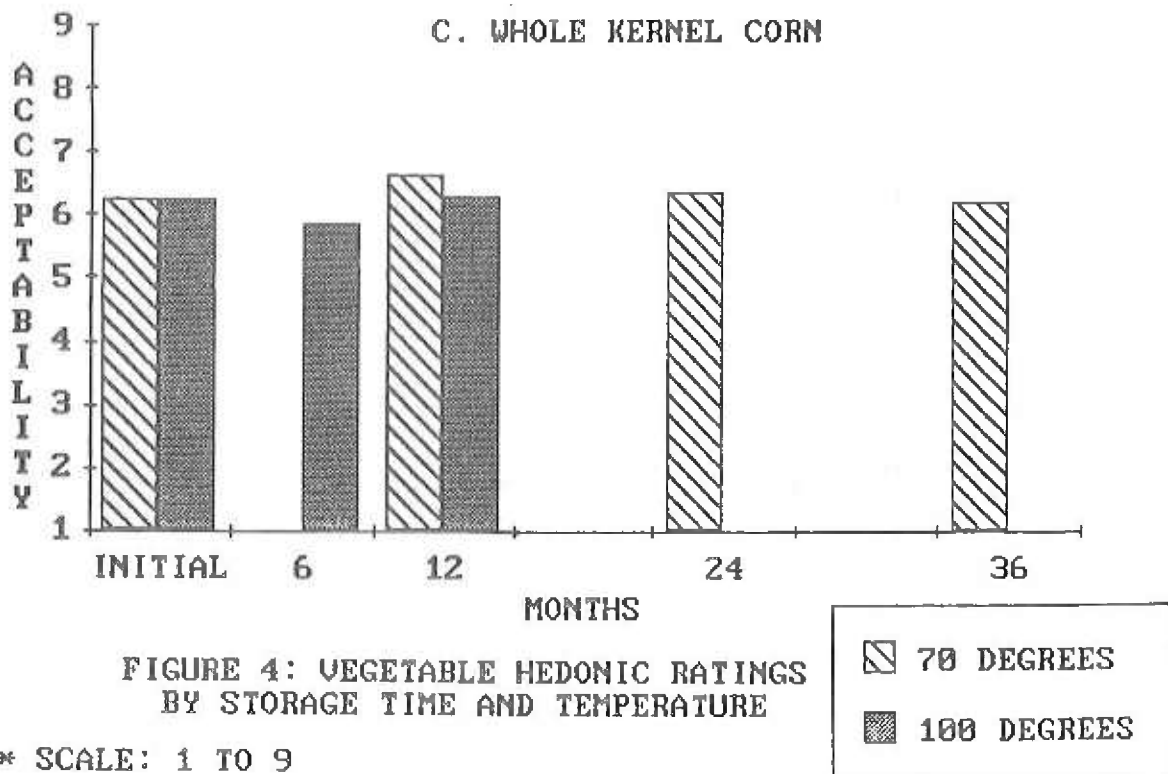


TABLE 4 (con'd)

D. Glazed Carrots

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.21                 | 1.74                 | 152      |
| 6 mo<br>100°F        | 6.10                 | 1.65                 | 152      |
| 12 mo<br>70°F        | 5.54                 | 1.80                 | 148      |
| 12 mo<br>100°F       | 5.41                 | 1.84                 | 152      |
| 24 mo<br>70°F        | 6.17                 | 1.57                 | 152      |
| 36 mo<br>70°F        | 6.48                 | 1.37                 | 152      |

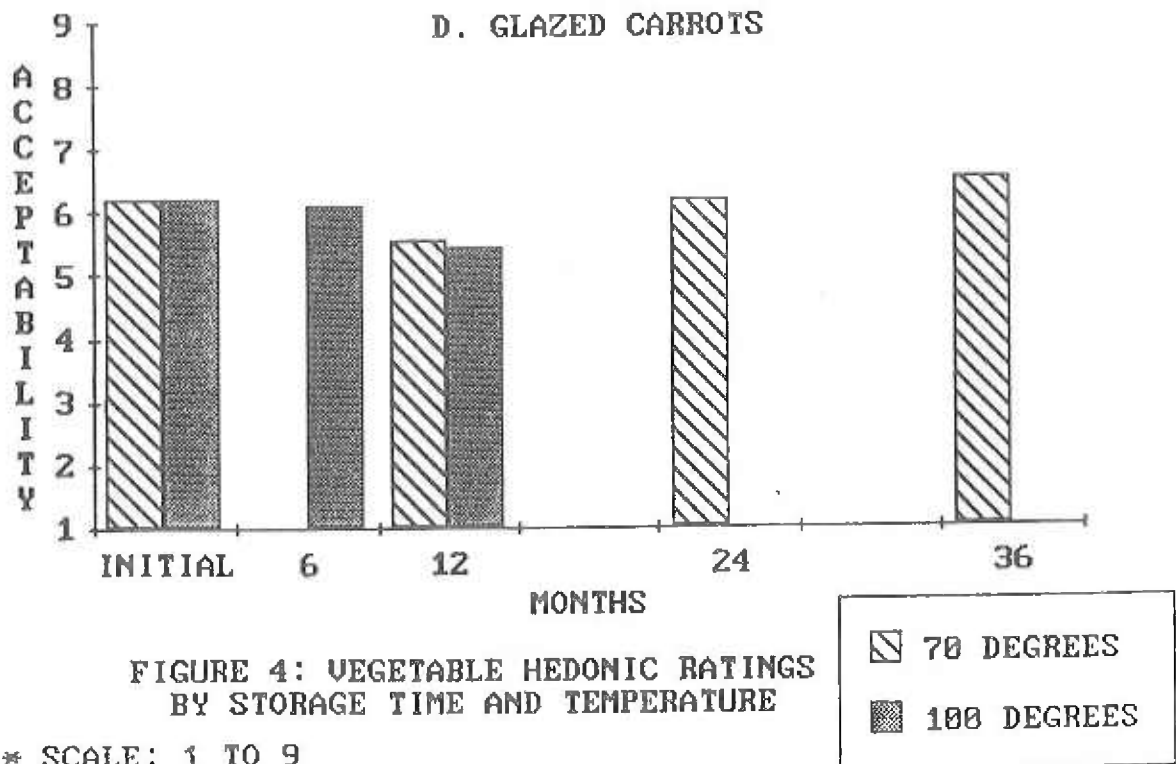


TABLE 4 (con'd)

E. Sliced Carrots

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 4.74                 | 1.62                 | 144      |
| 6 mo<br>100°F        | 4.99                 | 1.87                 | 144      |
| 12 mo<br>70°F        | 5.19                 | 1.91                 | 152      |
| 12 mo<br>100°F       | 3.98                 | 1.57                 | 152      |
| 24 mo<br>70°F        | 4.59                 | 1.75                 | 148      |
| 36 mo<br>70°F        | 4.78                 | 1.84                 | 152      |

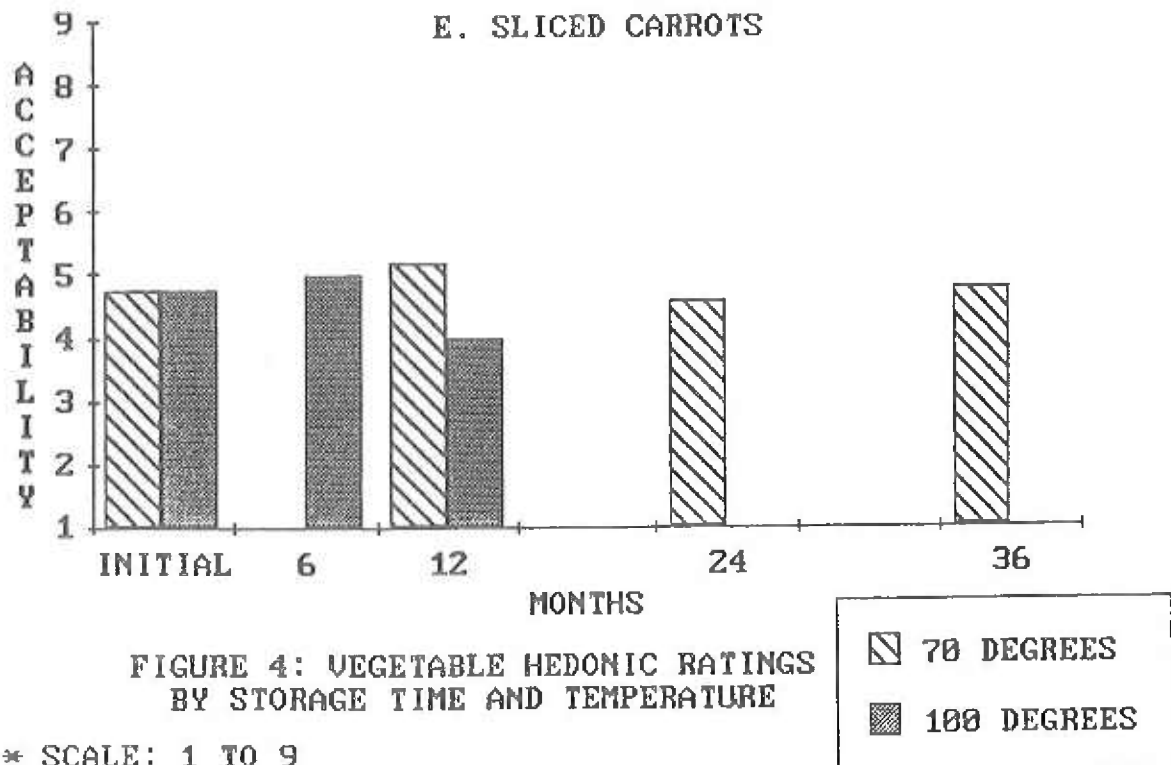


TABLE 4 (con'd)

F. Creamed Corn

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.69                 | 1.44                 | 152      |
| 6 mo<br>100°F        | 6.65                 | 1.36                 | 144      |
| 12 mo<br>70°F        | 6.89                 | 1.14                 | 148      |
| 12 mo<br>100°F       | 6.15                 | 1.77                 | 144      |
| 24 mo<br>70°F        | 6.58                 | 1.40                 | 152      |
| 36 mo<br>70°F        | 6.35                 | 1.61                 | 148      |

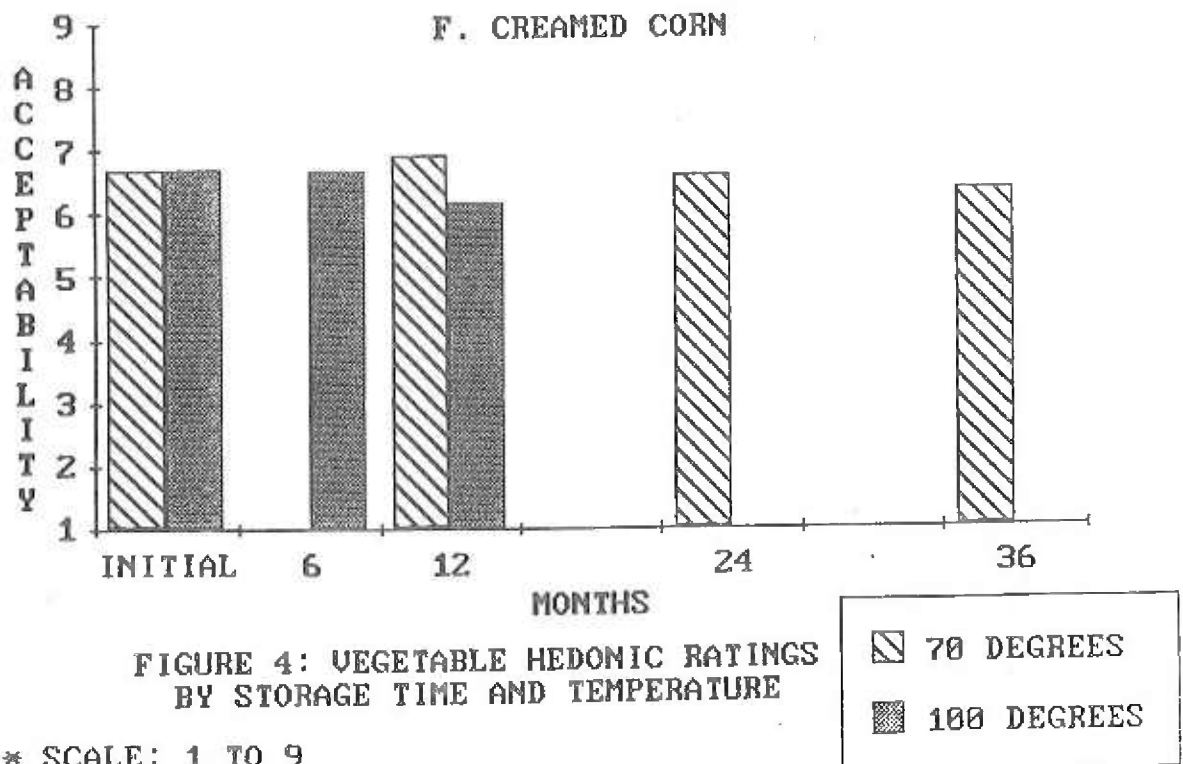


TABLE 4 (con'd)

G. Glazed Sweet Potatoes

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.46                 | 1.76                 | 146      |
| 6 mo<br>100°F        | 5.14                 | 2.02                 | 152      |
| 12 mo<br>70°F        | 5.86                 | 1.76                 | 152      |
| 12 mo<br>100°F       | 4.76                 | 1.91                 | 152      |
| 24 mo<br>70°F        | 5.41                 | 1.81                 | 152      |
| 36 mo<br>70°F        | 6.00                 | 1.88                 | 144      |

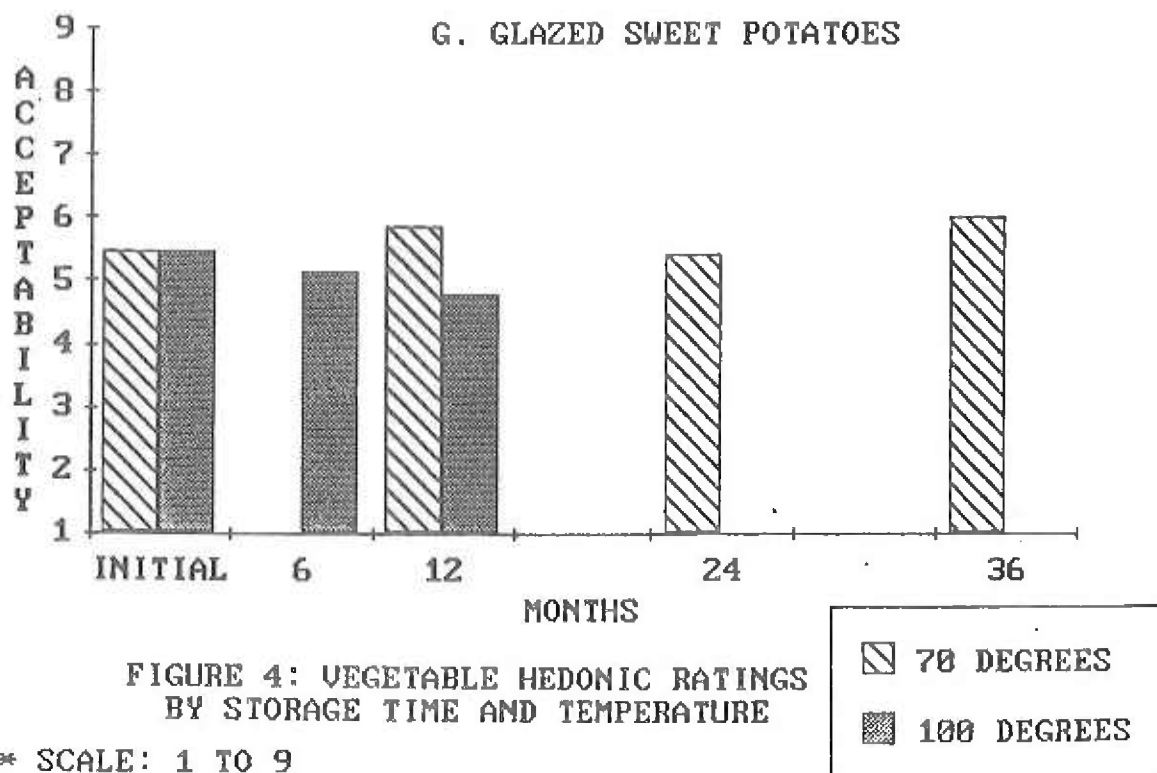




TABLE 4 (con'd)

H. Green Beans

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.83                 | 1.68                 | 144      |
| 6 mo<br>100°F        | 5.30                 | 1.89                 | 144      |
| 12 mo<br>70°F        | 6.20                 | 1.61                 | 144      |
| 12 mo<br>100°F       | 4.96                 | 1.82                 | 144      |
| 24 mo<br>70°F        | 5.18                 | 1.91                 | 144      |
| 36 mo<br>70°F        | 4.97                 | 1.89                 | 152      |

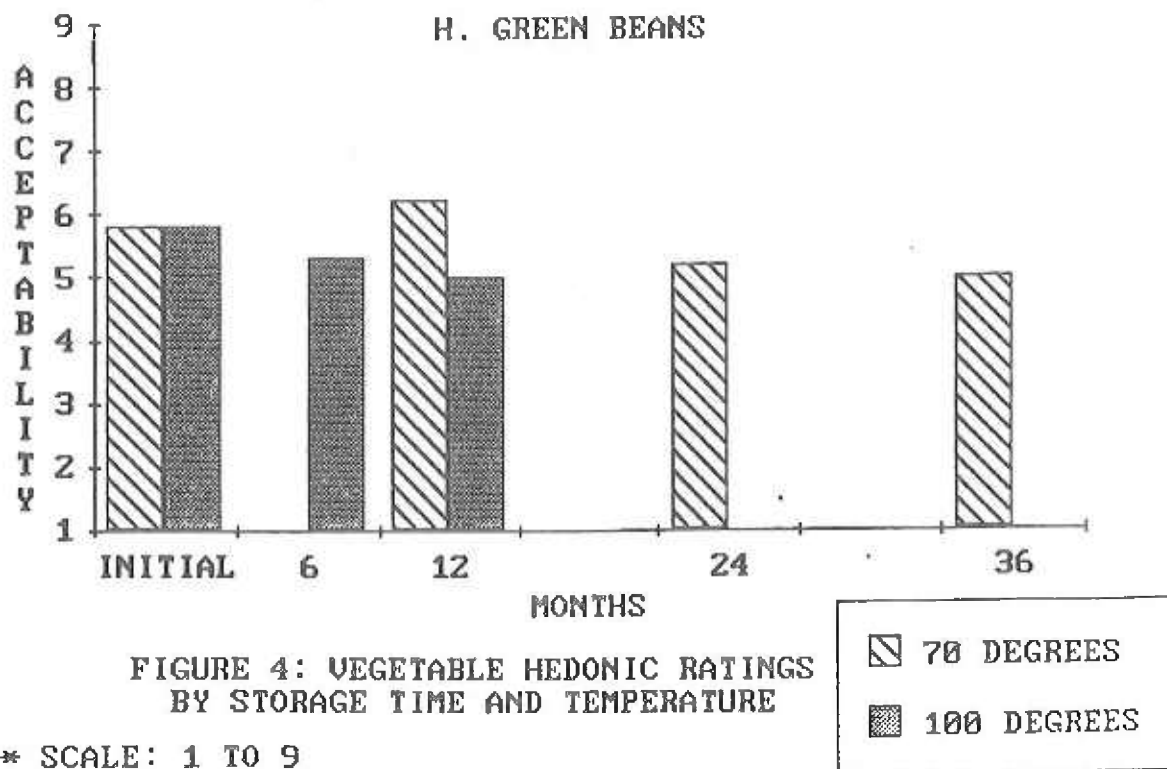
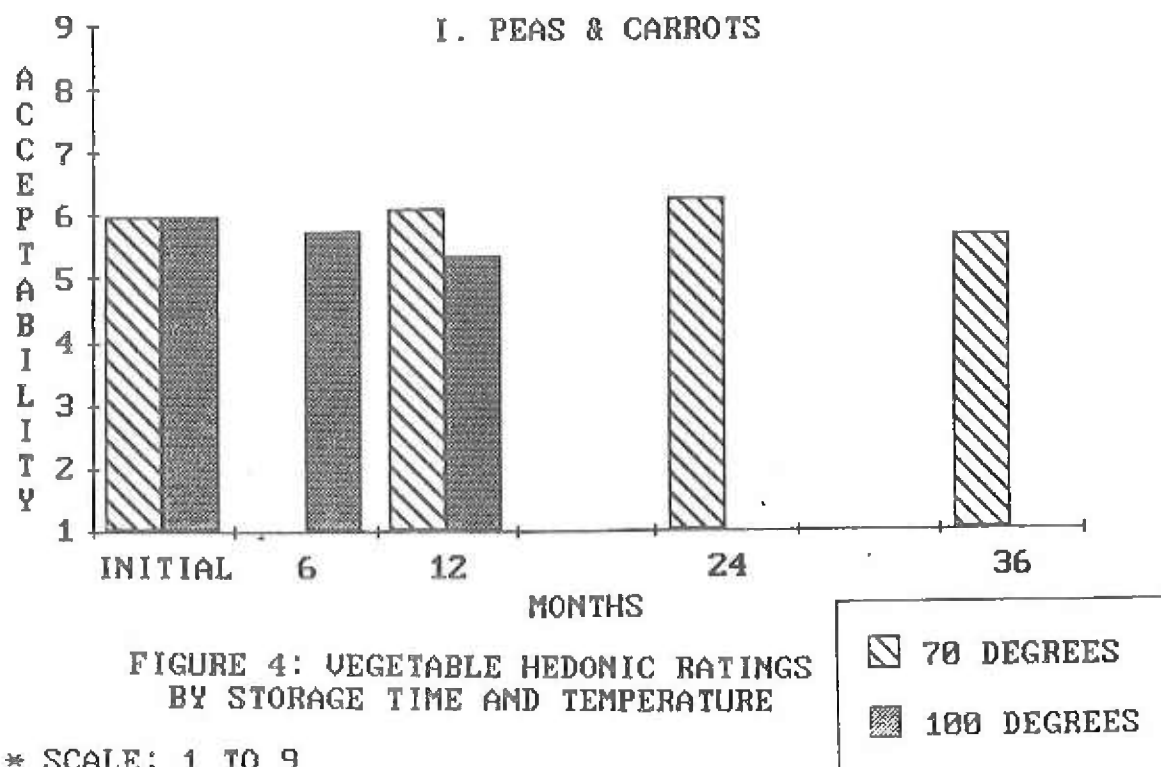


TABLE 4 (con'd)

## I. Peas &amp; Carrots

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.99                 | 1.96                 | 152      |
| 6 mo<br>100°F        | 5.72                 | 1.65                 | 152      |
| 12 mo<br>70°F        | 6.09                 | 1.72                 | 152      |
| 12 mo<br>100°F       | 5.34                 | 1.54                 | 152      |
| 24 mo<br>70°F        | 6.24                 | 1.25                 | 152      |
| 36 mo<br>70°F        | 5.67                 | 1.66                 | 152      |



## 5. STARCH PRODUCTS

### Buttered Noodles

No significant results were found with this Tray Pack.

### Beans with Bacon

At 70°F, a significant effect of time on acceptability was found ( $F(3,584)=6.28$ ,  $p<.0001$ ). The mean rating at 24 months ( $\bar{x}=5.79\pm1.73$ ) was significantly lower than all other means.

No significant effects on acceptability were found in the 100°F condition.

At 12 months, there was no significant effect of storage temperature on Tray Pack acceptability.

### Escalloped Potatoes

There were no significant findings with this Tray Pack.

### Potatoes with Butter Sauce

Time had a significant effect on the ratings of these Tray Packs stored in both temperature conditions. At 70°F, results showed that  $F(3,580)=11.92$  ( $p<.0001$ ) and that the 12 month mean ( $\bar{x}=5.61\pm1.76$ ) was significantly lower than the initial, 24, and 36 month means.

At 100°F, tests showed that  $F(2,428)=10.24$  ( $p<.0001$ ). Ratings decreased significantly from 0 months ( $\bar{x}=6.43\pm1.39$ ) to 6 months ( $\bar{x}=5.99\pm1.61$ ), then from 6 months to 12 months ( $\bar{x}=5.63\pm1.56$ ).

At 12 months, storage temperature showed no significant effect on ratings.

### Spanish Rice

Time did not have a significant effect on acceptability at 70°F.

At 100°F, time showed a significant effect on ratings ( $F(2,448)=14.72$ ,  $p<.0001$ ). The 6 month mean ( $\bar{x}=5.22\pm1.81$ ) was significantly lower than both the initial mean ( $\bar{x}=6.15\pm1.81$ ) and the 12 month mean ( $\bar{x}=6.21\pm1.71$ ).

No effect of storage temperature on acceptability ratings was found at 12 months.

### Potato Salad

There was a significant effect of time on acceptability ratings at 100°F ( $F(2,424)=15.72$ ,  $p<.0001$ ). Acceptability ratings at 12 months ( $\bar{x}=4.99\pm1.76$ ) were significantly lower than ratings at 0 and 6 months.

Storage temperature showed a significant effect on acceptability at 12 months ( $F(1,292)=10.55$ ,  $p<.001$ ). The 70°F mean rating

( $x=5.63\pm1.64$ ) was significantly higher than the 100°F mean rating ( $x=4.99\pm1.76$ ).

#### White Rice

There were no significant findings with this Tray Pack.

#### Macaroni Salad

This product began testing one year later than other products. The most recent data for the product were collected at 24 months. Until this time, the main effect of time on acceptability of 70°F Tray Packs was significant ( $F(2,440)=5.61$ ,  $p<.004$ ). Ratings at 24 months were significantly lower than ratings at 0 months.

The main effect of time with the 100°F Tray Packs was also significant ( $F(2,432)=11.07$ ,  $p<.0001$ ). Ratings decreased over time such that at 12 months, mean ratings were significantly lower than those at 0 and 6 months.

At 12 months, the effect of temperature on acceptability was significant ( $F(1,288)=5.99$ ,  $p<.015$ ). Ratings of the Tray Packs stored at 100°F were significantly lower than ratings of those stored at 70°F.

### Macaroni and Cheese

The effect of time on acceptability of the Tray Packs stored at 70°F was significant ( $F(3,588)=4.45$ ,  $p<.004$ ). Post hoc tests showed that mean acceptability ratings at 24 months were significantly higher than ratings at 12 and 36 months.

There were no other significant findings with this Tray Pack.

TABLE 5  
STARCH HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Buttered Noodles

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.36                 | 1.82                 | 152      |
| 6 mo<br>100°F        | 4.89                 | 2.03                 | 160      |
| 12 mo<br>70°F        | 5.36                 | 2.00                 | 152      |
| 12 mo<br>100°F       | 5.01                 | 1.99                 | 152      |
| 24 mo<br>70°F        | 5.66                 | 1.99                 | 148      |
| 36 mo<br>70°F        | 5.45                 | 1.84                 | 152      |

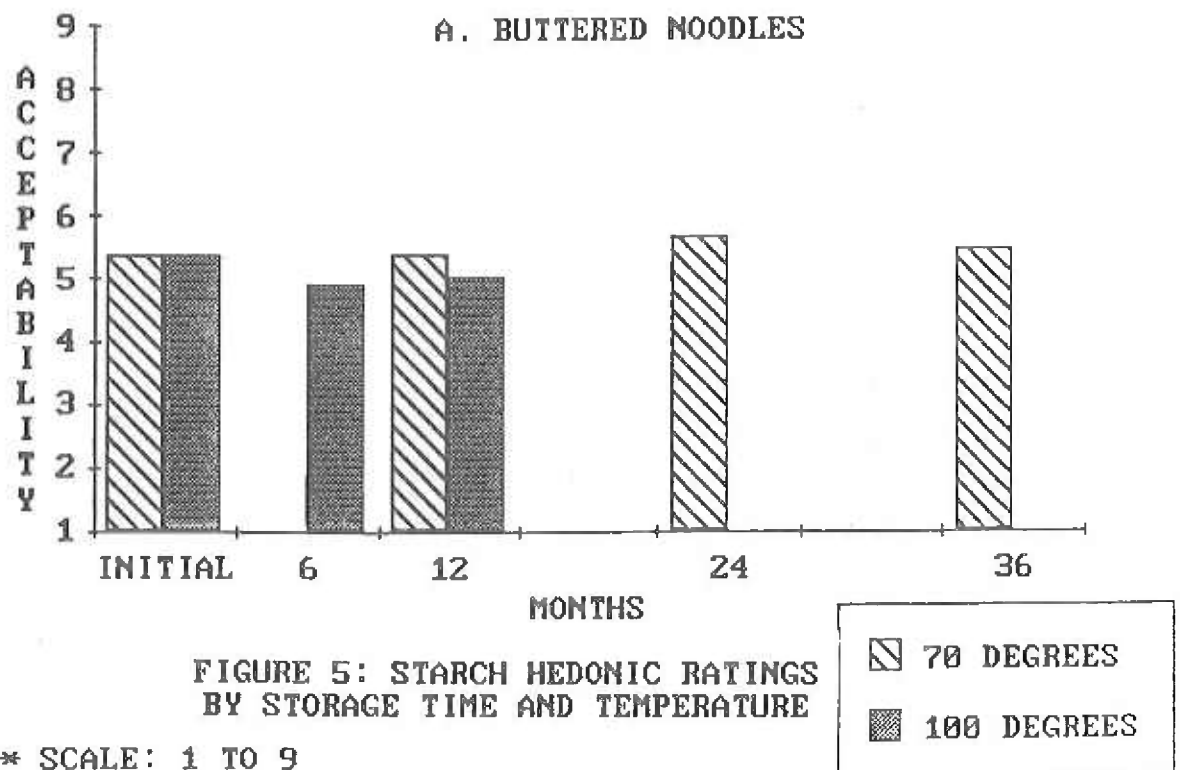


TABLE 5 (con'd)

B. Beans with Bacon

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev</u> | <u>N</u> |
|----------------------|----------------------|---------------------|----------|
| 0 mo                 | 6.43                 | 1.46                | 160      |
| 6 mo<br>100°F        | 6.19                 | 1.44                | 144      |
| 12 mo<br>70°F        | 6.50                 | 1.52                | 144      |
| 12 mo<br>100°F       | 6.35                 | 1.47                | 144      |
| 24 mo<br>70°F        | 5.79                 | 1.73                | 144      |
| 36 mo<br>70°F        | 6.30                 | 1.40                | 152      |

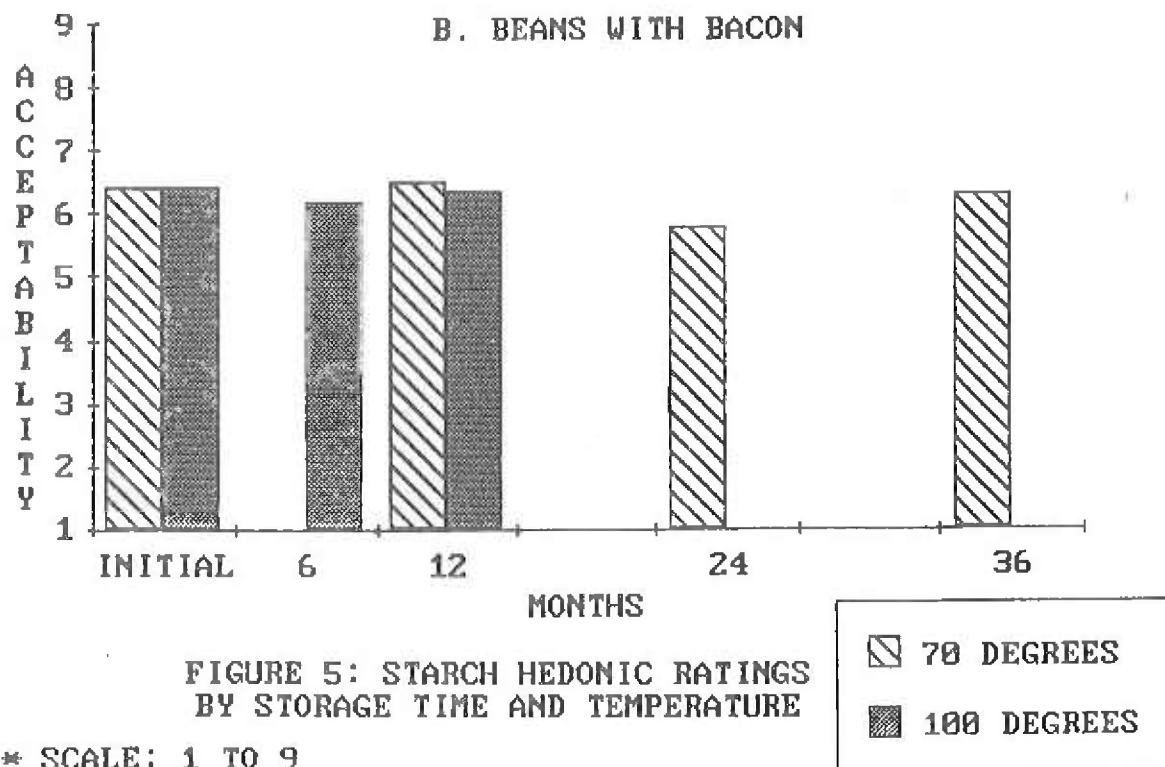
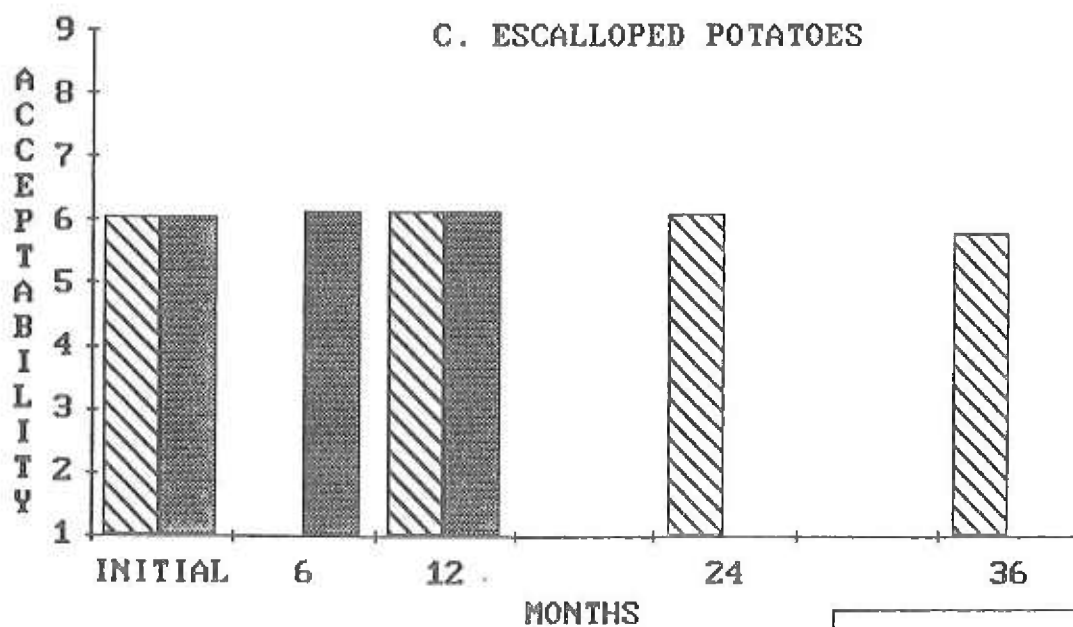




TABLE 5 (con'd)

C. Escalloped Potatoes

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.07                 | 1.56                 | 144      |
| 6 mo<br>100°F        | 6.15                 | 1.52                 | 152      |
| 12 mo<br>70°F        | 6.13                 | 1.45                 | 152      |
| 12 mo<br>100°F       | 6.13                 | 1.51                 | 152      |
| 24 mo<br>70°F        | 6.10                 | 1.67                 | 152      |
| 36 mo<br>70°F        | 5.78                 | 1.64                 | 152      |

FIGURE 5: STARCH HEDONIC RATINGS  
BY STORAGE TIME AND TEMPERATURE

\* SCALE: 1 TO 9

▨ 70 DEGREES  
■ 100 DEGREES

TABLE 5 (con'd)

D. Potatoes with Butter Sauce

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.43                 | 1.39                 | 144      |
| 6 mo<br>100°F        | 5.99                 | 1.61                 | 144      |
| 12 mo<br>70°F        | 5.61                 | 1.76                 | 152      |
| 12 mo<br>100°F       | 5.63                 | 1.56                 | 152      |
| 24 mo<br>70°F        | 6.50                 | 1.33                 | 148      |
| 36 mo<br>70°F        | 6.36                 | 1.34                 | 152      |

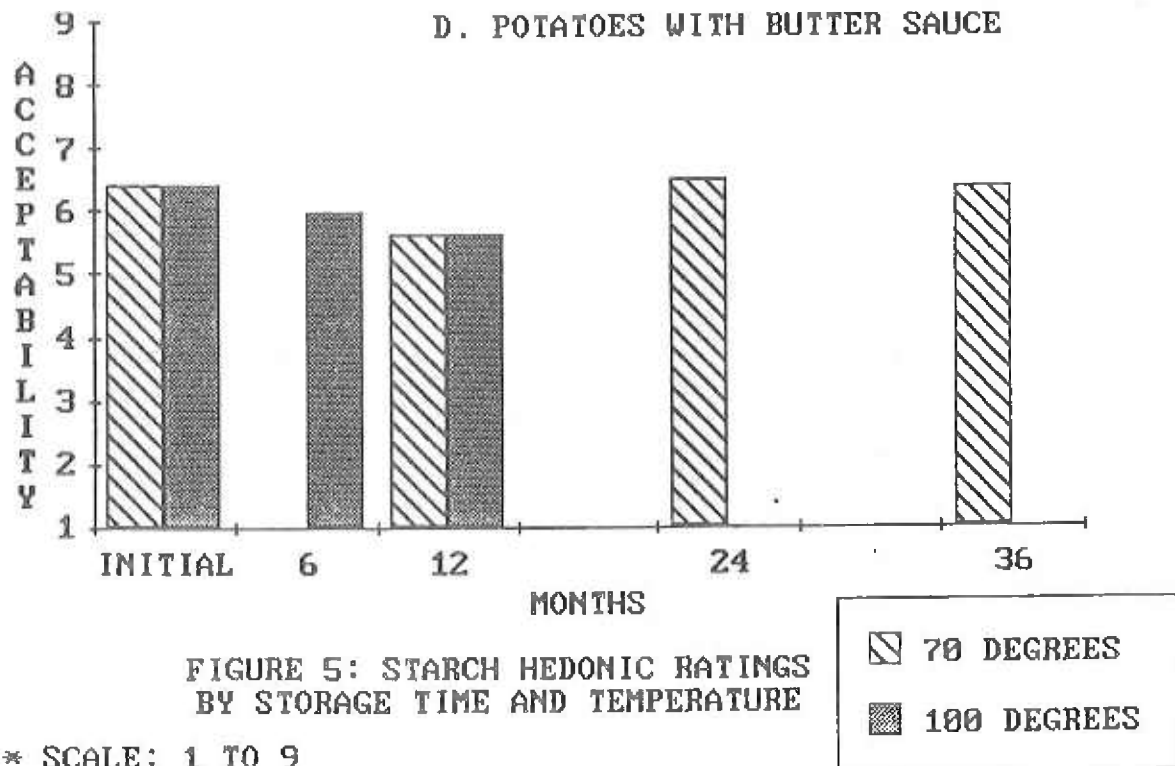


TABLE 5 (con'd)

E. Spanish Rice

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.15                 | 1.81                 | 152      |
| 6 mo<br>100°F        | 5.22                 | 1.81                 | 156      |
| 12 mo<br>70°F        | 6.14                 | 1.61                 | 148      |
| 12 mo<br>100°F       | 6.21                 | 1.71                 | 152      |
| 24 mo<br>70°F        | 5.87                 | 1.64                 | 152      |
| 36 mo<br>70°F        | 6.01                 | 1.60                 | 152      |

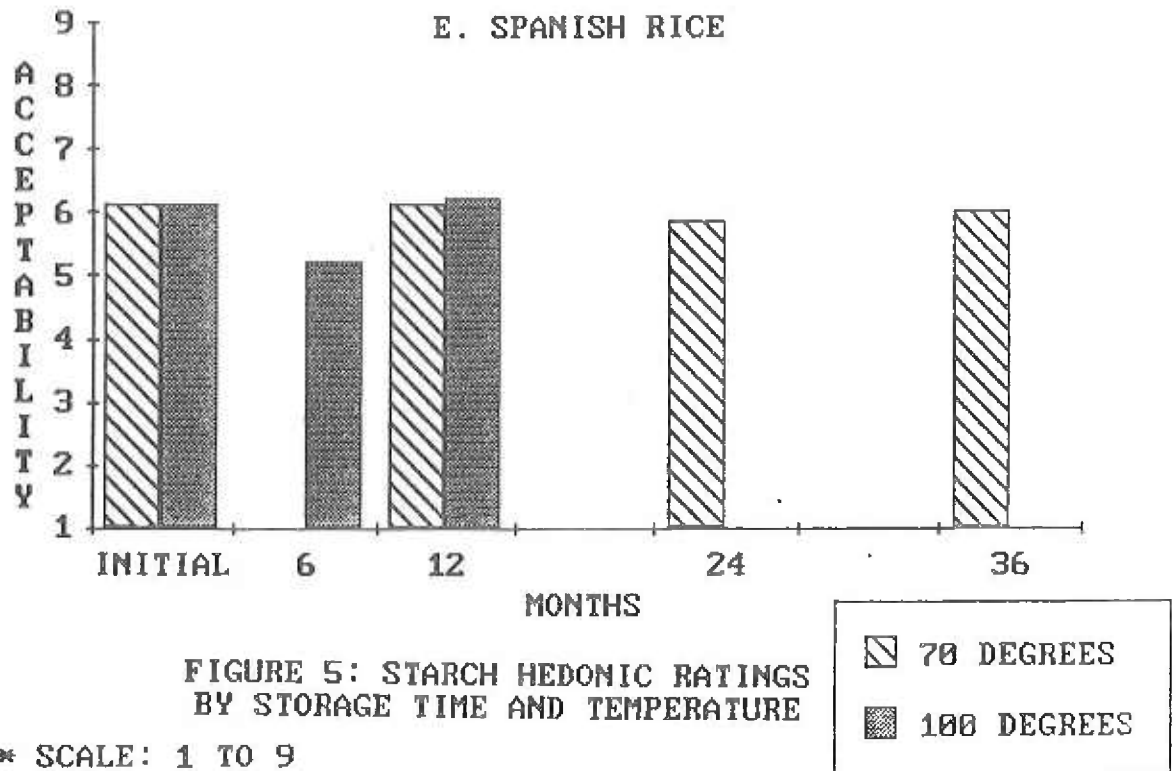


TABLE 5 (con'd)

F. Potato Salad

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.85                 | 1.49                 | 144      |
| 6 mo<br>100°F        | 6.02                 | 1.76                 | 144      |
| 12 mo<br>70°F        | 5.63                 | 1.64                 | 152      |
| 12 mo<br>100°F       | 4.99                 | 1.76                 | 148      |
| 24 mo<br>70°F        | 5.64                 | 1.78                 | 152      |
| 36 mo<br>70°F        | 5.56                 | 1.61                 | 152      |

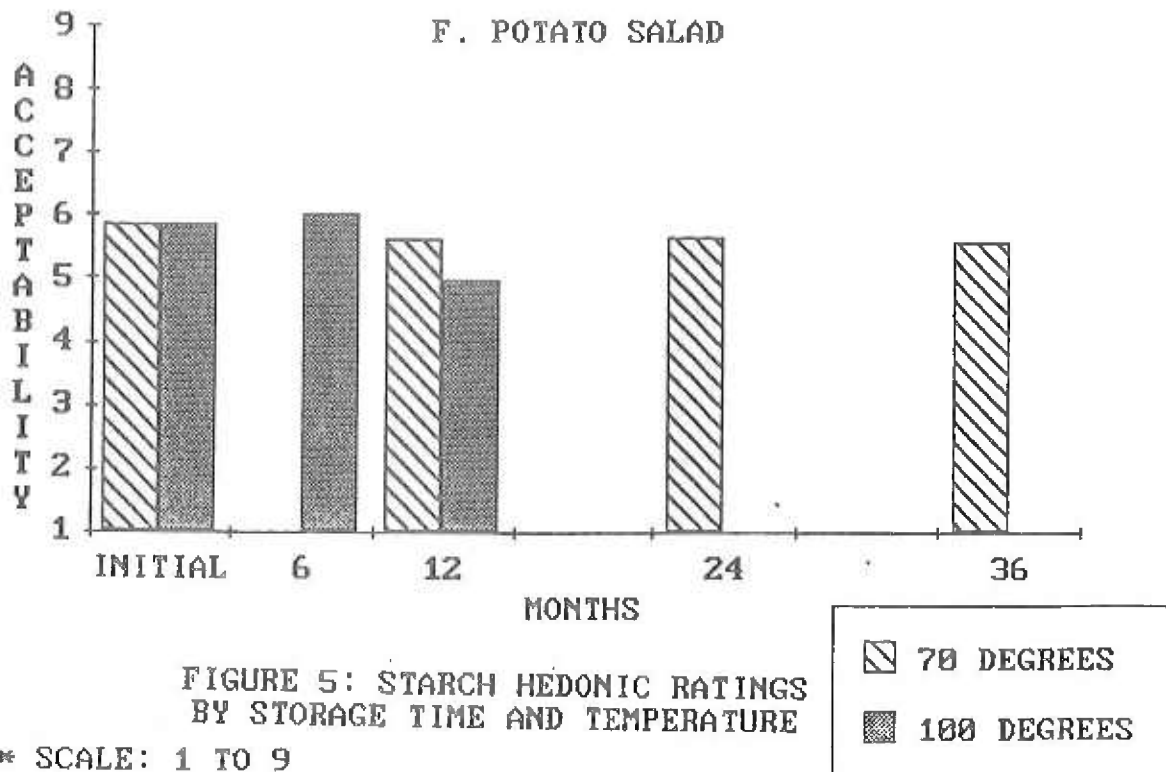


TABLE 5 (con'd)

G. White Rice

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.56                 | 1.41                 | 144      |
| 6 mo<br>100°F        | 6.62                 | 1.41                 | 152      |
| 12 mo<br>70°F        | 6.30                 | 1.74                 | 152      |
| 12 mo<br>100°F       | 6.29                 | 1.63                 | 152      |
| 24 mo<br>70°F        | 6.45                 | 1.56                 | 152      |
| 36 mo<br>70°F        | 6.45                 | 1.53                 | 152      |

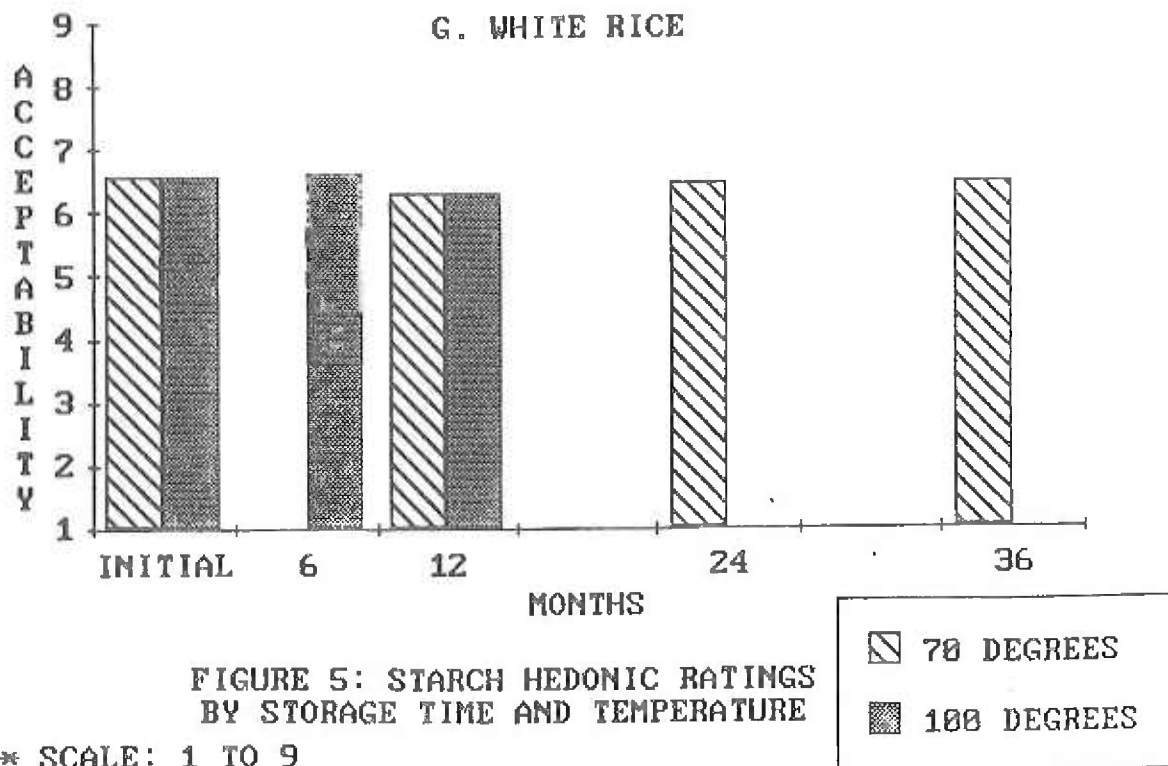


TABLE 5 (con'd)

H. Macaroni Salad

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 5.70                 | 1.64                 | 152      |
| 6 mo<br>100°F        | 5.46                 | 1.46                 | 144      |
| 12 mo<br>70°F        | 5.35                 | 1.86                 | 148      |
| 12 mo<br>100°F       | 4.83                 | 1.77                 | 148      |
| 24 mo<br>70°F        | 4.99                 | 2.00                 | 152      |

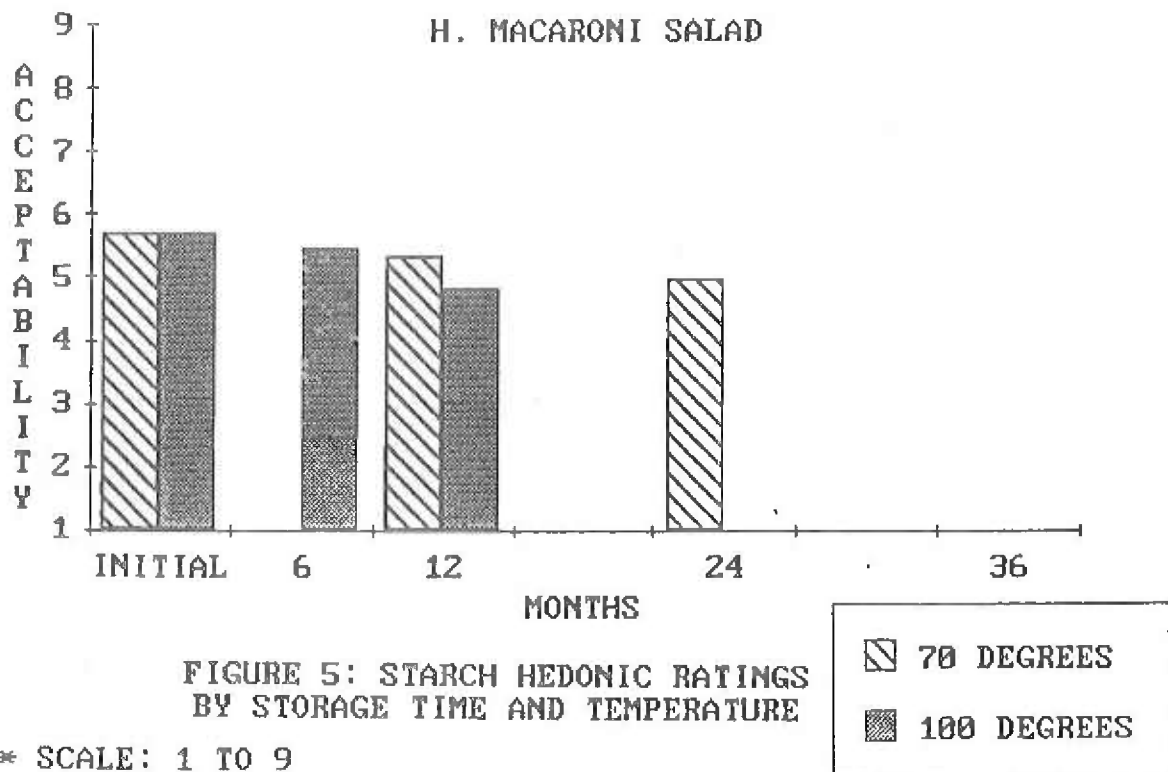
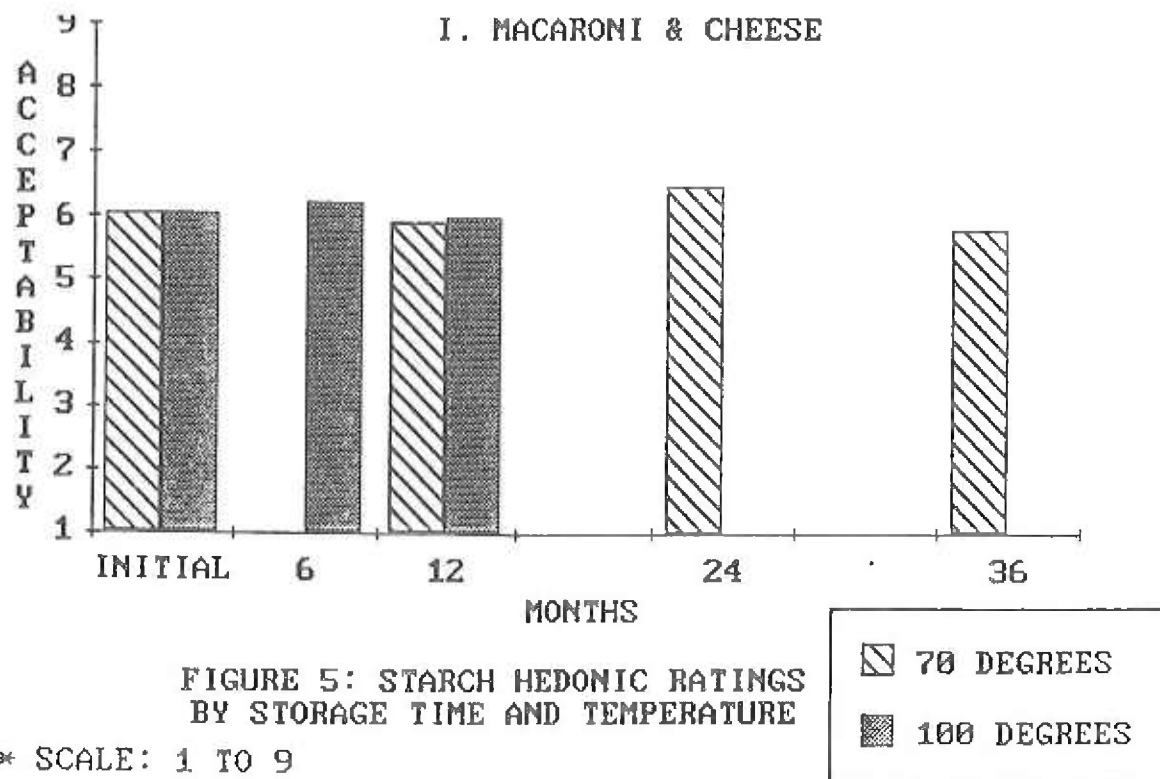


TABLE 5 (con'd)

I. Macaroni & Cheese

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.07                 | 1.70                 | 152      |
| 6 mo<br>100°F        | 6.22                 | 1.78                 | 152      |
| 12 mo<br>70°F        | 5.91                 | 1.85                 | 152      |
| 12 mo<br>100°F       | 5.98                 | 1.86                 | 152      |
| 24 mo<br>70°F        | 6.46                 | 1.57                 | 148      |
| 36 mo<br>70°F        | 5.78                 | 1.66                 | 152      |



## 6. DESSERTS

### Chocolate Pudding

There was no significant finding with this Tray Pack item.

### Marble Cake

At 70°F, the effect of time on Tray Pack ratings was significant ( $F(3,588)=3.25$ ,  $p<.022$ ). The mean rating was highest at 24 months ( $\bar{x}=6.74\pm1.14$ ) and it differed significantly from the lowest mean rating ( $\bar{x}=6.33\pm1.38$ ), which occurred at 12 months.

Time did not have a significant effect on acceptability in the 100°F condition.

At 12 months of storage, there was a significant effect of temperature on Tray Pack ratings ( $F(1,292)=4.33$ ,  $p<.038$ ) such that ratings were higher in the 100°F condition than in the 70°F condition.

### Pound Cake

There was a highly significant effect of time on the acceptability of this Tray Pack in the 70°F storage condition ( $F(3,588)=10.77$ ),  $p<.0001$ ).



The effect of time was also significant at 100°F ( $F(2,436)=8.46$ ,  $p<.0001$ ). Initial ratings were significantly higher than ratings at 6 and 12 months.

The main effect of temperature was not significant at 12 months.

### Spice Cake

Time significantly affected ratings of the Tray Pack in the 70°F condition ( $F(3,572)=9.22$ ,  $p<.0001$ ). At 36 months, the mean rating was highest ( $\bar{x}=6.85\pm1.18$ ) and post hoc tests showed that it differed from mean ratings at 0, 12, and 24 months.

Time also had a significant effect on acceptability in the 100°F condition ( $F(2,420)=11.40$ ,  $p<.0001$ ). Mean ratings decreased over time such that at 12 months, ratings were significantly lower than those at 0 and 6 months.

The effect of temperature on acceptability of this Tray Pack item was significant ( $F(1,280)=7.72$ ,  $p<.006$ ). The mean acceptability score was lower in the 100°F condition than in the 70°F condition.

### Apple Coffee Cake

At 70°F, the effect of time on Tray Pack acceptability was significant such that  $p<.0001$  ( $F(3,584)=7.68$ ). Initial ratings were highest ( $\bar{x}=6.87\pm1.04$ ) and differed significantly from ratings at 12, 24, and 36 months.

The main effect of time was significant in the 100°F storage condition as well ( $F(2,428)=12.40$ ,  $p<.0001$ ). Acceptability ratings decreased over time.

There was no effect of temperature on acceptability at 12 months of storage.

#### Apple Dessert

Time had a significant effect on taste test ratings in both temperature conditions. At 70°F, tests showed that  $F(3,576)=14.46$ ,  $p<.0001$  and at 100°F,  $F(2,420)=17.57$ ,  $p<.0001$ . In the latter condition, mean ratings decreased over time such that there was a significant difference between ratings at 12 months and each of 0 and 6 months.

The main effect of temperature on acceptability of this item was not significant.

#### Chocolate Cake

At 70°F, there was a significant main effect of time on acceptability ( $F(3,588)=6.88$ ,  $p<.0001$ ).

At 100°F, the effect of time was also significant ( $F(2,440)=11.14$ ,  $p<.0001$ ). Acceptability ratings decreased over time such that ratings at 6 months ( $\bar{x}=5.66\pm1.57$ ) and 12 months

( $x=5.74\pm1.70$ ) were significantly lower than those at 0 months ( $x=6.46\pm1.51$ ).

The effect of temperature on acceptability at 12 months did not meet statistical significance.

#### Cherry Dessert

The effect of time was not significant in the 70°F condition. Time showed a significant effect on ratings under 100°F storage conditions ( $F(2,428)=10.67$ ,  $p<.0001$ ). The mean acceptability rating was higher at 0 months ( $x=7.00\pm1.34$ ) than at 6 and 12 months.

At 12 months of storage, there was a significant effect of temperature on acceptability scores ( $F(1,284)=17.02$ ,  $p<.0001$ ) such that the mean rating under 100°F conditions was lower than the rating under 70°F conditions.

#### Blueberry Dessert

At 70°F, there was a highly significant effect of time on the acceptability of this item ( $F(3,576)=12.67$ ,  $p<.0001$ ). Ratings at 0 months were highest ( $x=6.99\pm1.45$ ) and differed from ratings at all other times.

At 100°F, there was also a highly significant effect of time on acceptability ( $F(2,436)=35.85$ ,  $p<.0001$ ). Ratings decreased over time

such that ratings at 0, 6, and 12 months all differed significantly from one another.

At 12 months, the main effect of temperature was significant at  $p < .0001$  ( $F(1,288) = 19.36$ ). Ratings under 100°F storage ( $x = 5.37 \pm 1.99$ ) were lower than those under 70°F ( $x = 6.26 \pm 1.46$ ).

TABLE 6  
DESSERT HEDONIC RATINGS BY STORAGE TIME AND TEMPERATURE

A. Chocolate Pudding

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.53                 | 1.90                 | 152      |
| 6 mo<br>100°F        | 6.58                 | 1.70                 | 144      |
| 12 mo<br>70°F        | 6.67                 | 1.42                 | 152      |
| 12 mo<br>100°F       | 6.61                 | 1.85                 | 144      |
| 24 mo<br>70°F        | 6.91                 | 1.26                 | 152      |
| 36 mo<br>70°F        | 6.66                 | 1.54                 | 152      |

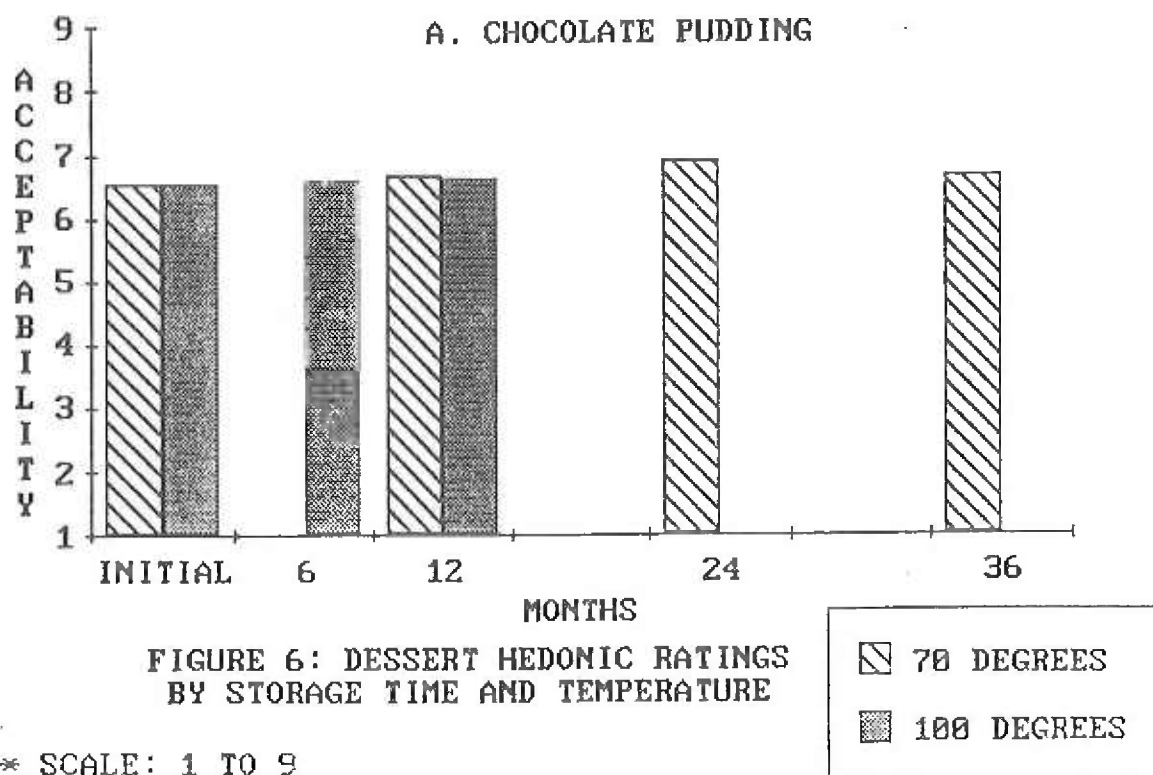


TABLE 6(con'd)

B. Marble Cake

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.66                 | 1.43                 | 152      |
| 6 mo<br>100°F        | 6.41                 | 1.46                 | 140      |
| 12 mo<br>70°F        | 6.33                 | 1.38                 | 148      |
| 12 mo<br>100°F       | 6.62                 | .98                  | 152      |
| 24 mo<br>70°F        | 6.74                 | 1.14                 | 152      |
| 36 mo<br>70°F        | 6.43                 | 1.21                 | 152      |

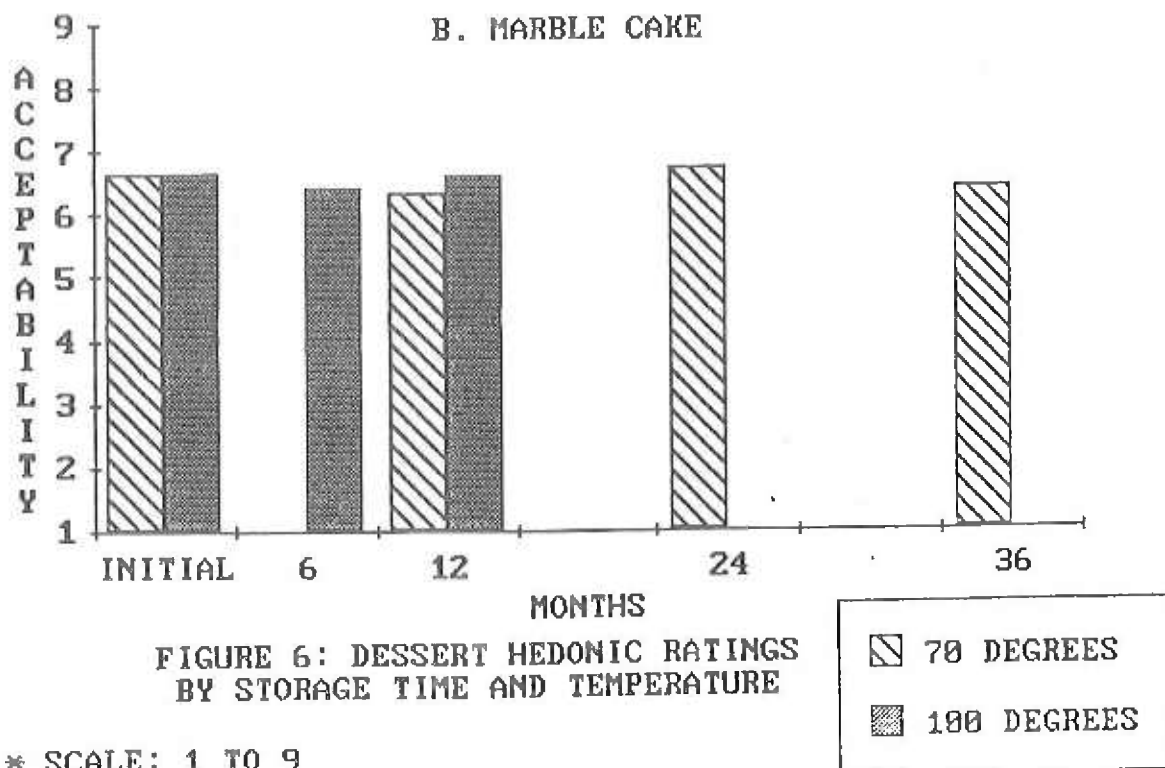


TABLE 6 (con'd)

C. Pound Cake

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.22                 | 1.23                 | 152      |
| 6 mo<br>100°F        | 5.76                 | 1.59                 | 144      |
| 12 mo<br>70°F        | 5.76                 | 1.43                 | 148      |
| 12 mo<br>100°F       | 5.56                 | 1.42                 | 152      |
| 24 mo<br>70°F        | 6.48                 | 1.36                 | 152      |
| 36 mo<br>70°F        | 5.68                 | 1.58                 | 152      |

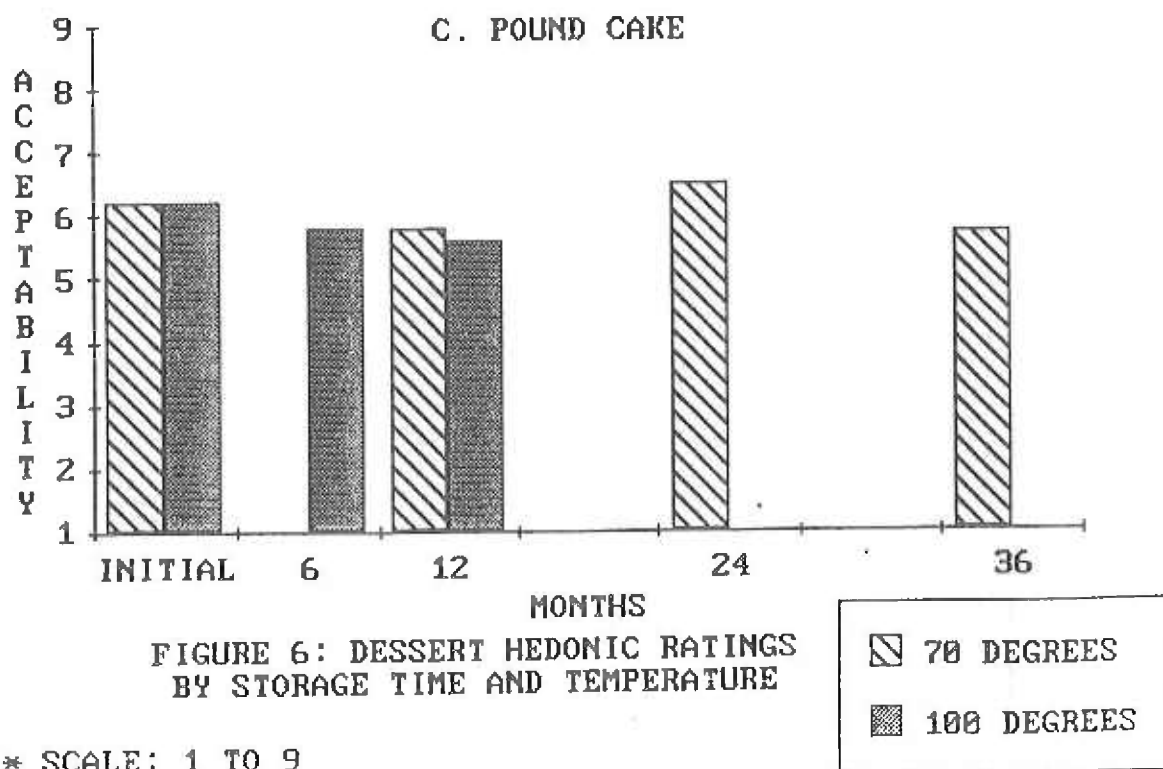


TABLE 6 (con'd)

D. Spice Cake

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.49                 | 1.29                 | 144      |
| 6 mo<br>100°F        | 6.24                 | 1.28                 | 144      |
| 12 mo<br>70°F        | 6.20                 | 1.38                 | 144      |
| 12 mo<br>100°F       | 5.68                 | 1.75                 | 144      |
| 24 mo<br>70°F        | 6.14                 | 1.35                 | 148      |
| 36 mo<br>70°F        | 6.85                 | 1.18                 | 152      |

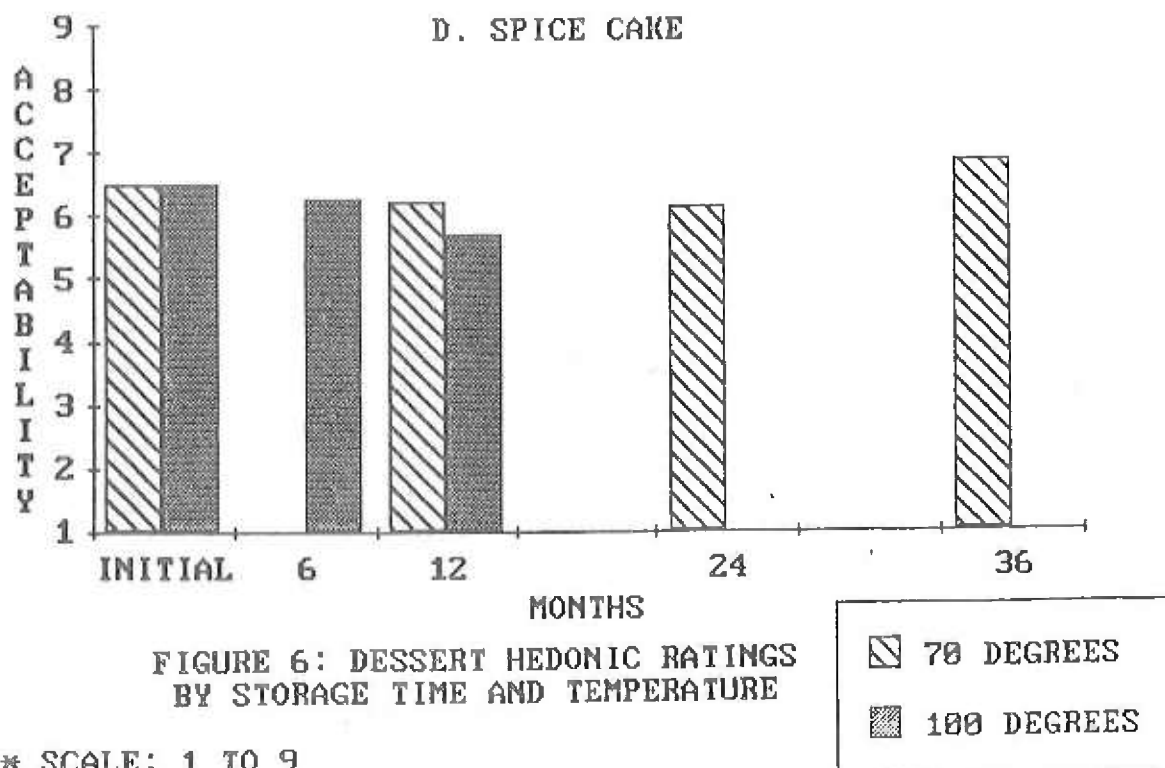




TABLE 6(con'd)

E. Apple Coffee Cake

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.87                 | 1.04                 | 144      |
| 6 mo<br>100°F        | 6.46                 | .99                  | 144      |
| 12 mo<br>70°F        | 6.36                 | 1.19                 | 152      |
| 12 mo<br>100°F       | 6.15                 | 1.56                 | 152      |
| 24 mo<br>70°F        | 6.18                 | 1.69                 | 152      |
| 36 mo<br>70°F        | 6.22                 | 1.44                 | 152      |

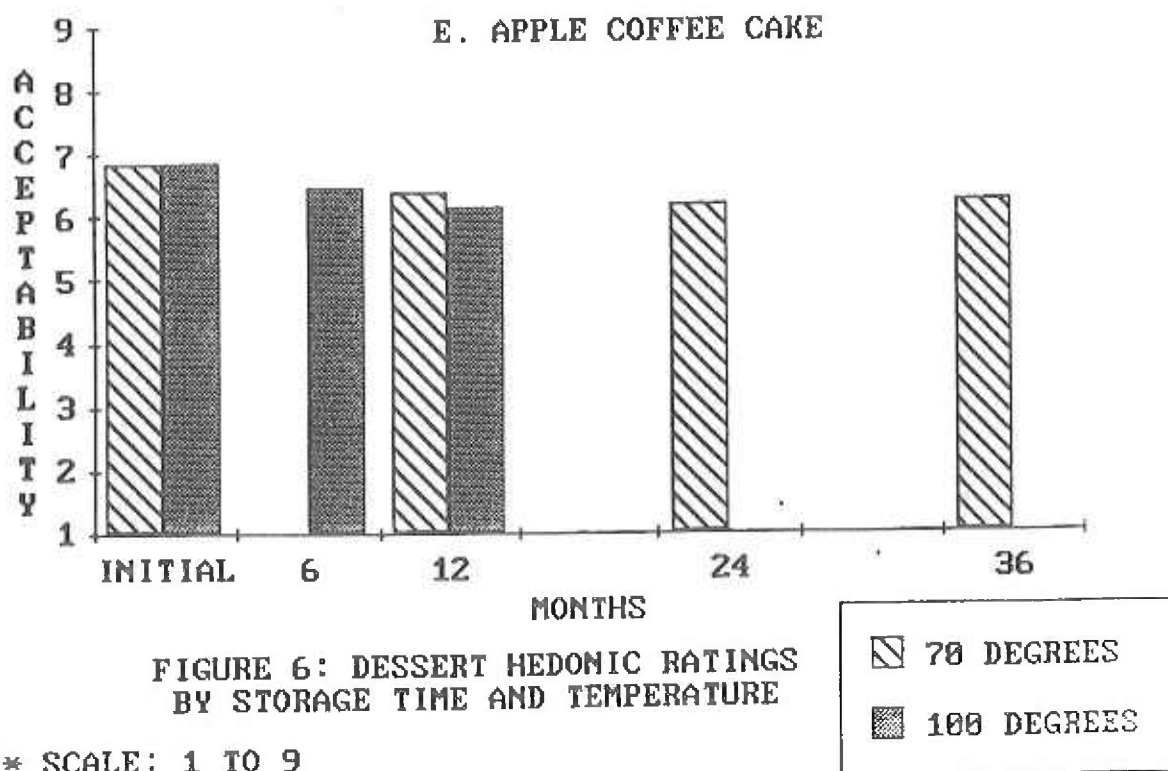


TABLE 6(con'd)

F. Apple Dessert

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.98                 | 1.43                 | 144      |
| 6 mo<br>100°F        | 6.74                 | 1.32                 | 144      |
| 12 mo<br>70°F        | 5.74                 | 1.77                 | 144      |
| 12 mo<br>100°F       | 5.97                 | 1.71                 | 144      |
| 24 mo<br>70°F        | 6.49                 | 1.68                 | 152      |
| 36 mo<br>70°F        | 6.23                 | 1.62                 | 152      |

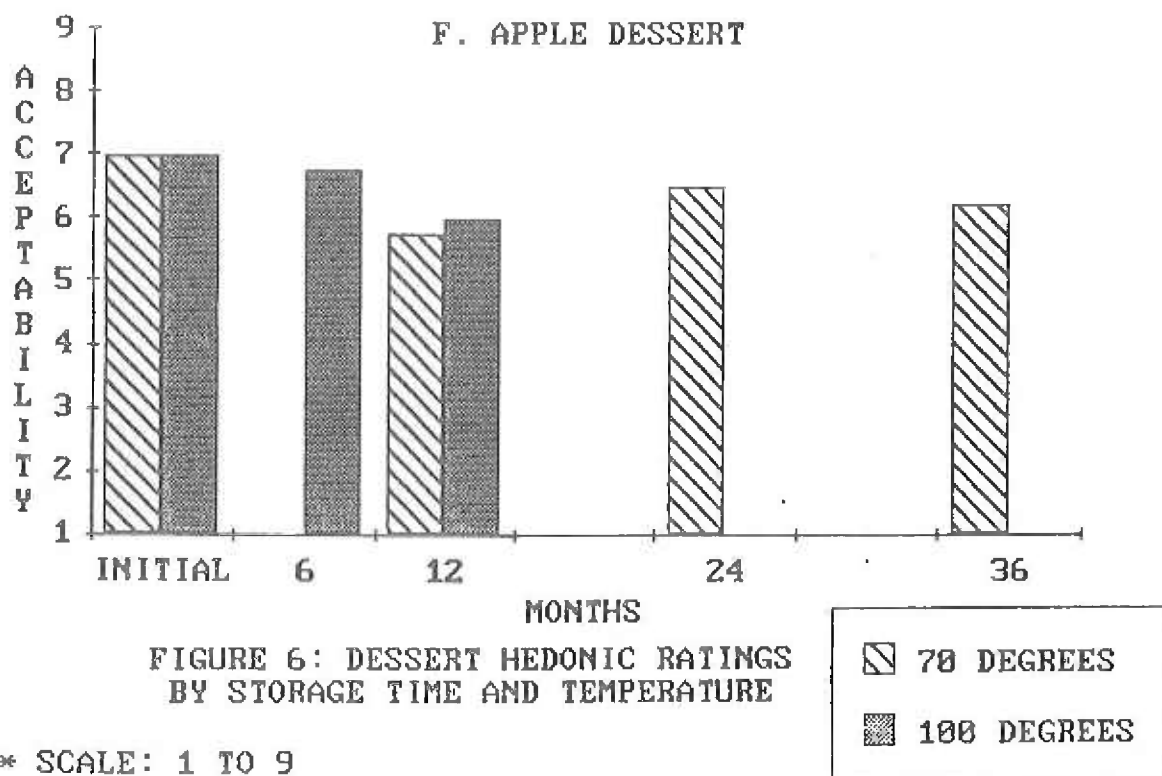


TABLE 6 (con'd)

G. Chocolate Cake

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 6.46                 | 1.51                 | 148      |
| 6 mo<br>100°F        | 5.66                 | 1.57                 | 148      |
| 12 mo<br>70°F        | 5.93                 | 1.34                 | 152      |
| 12 mo<br>100°F       | 5.74                 | 1.70                 | 156      |
| 24 mo<br>70°F        | 5.73                 | 1.49                 | 152      |
| 36 mo<br>70°F        | 6.22                 | 1.61                 | 152      |

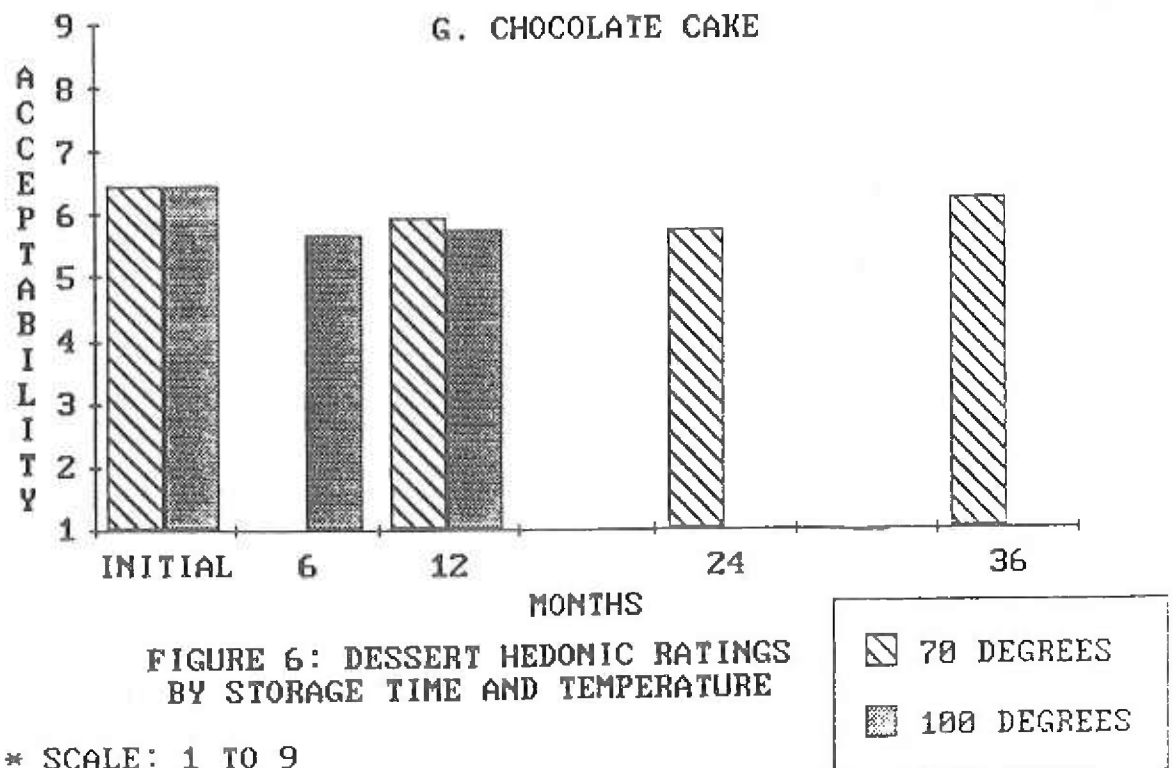


TABLE 6 (CON'D)

H. Cherry Dessert

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo                 | 7.00                 | 1.34                 | 144      |
| 6 mo<br>100°F        | 6.38                 | 2.02                 | 152      |
| 12 mo<br>70°F        | 6.91                 | 1.73                 | 148      |
| 12 mo<br>100°F       | 6.10                 | 1.61                 | 144      |
| 24 mo<br>70°F        | 6.78                 | 1.67                 | 152      |
| 36 mo<br>70°F        | 6.53                 | 1.78                 | 152      |

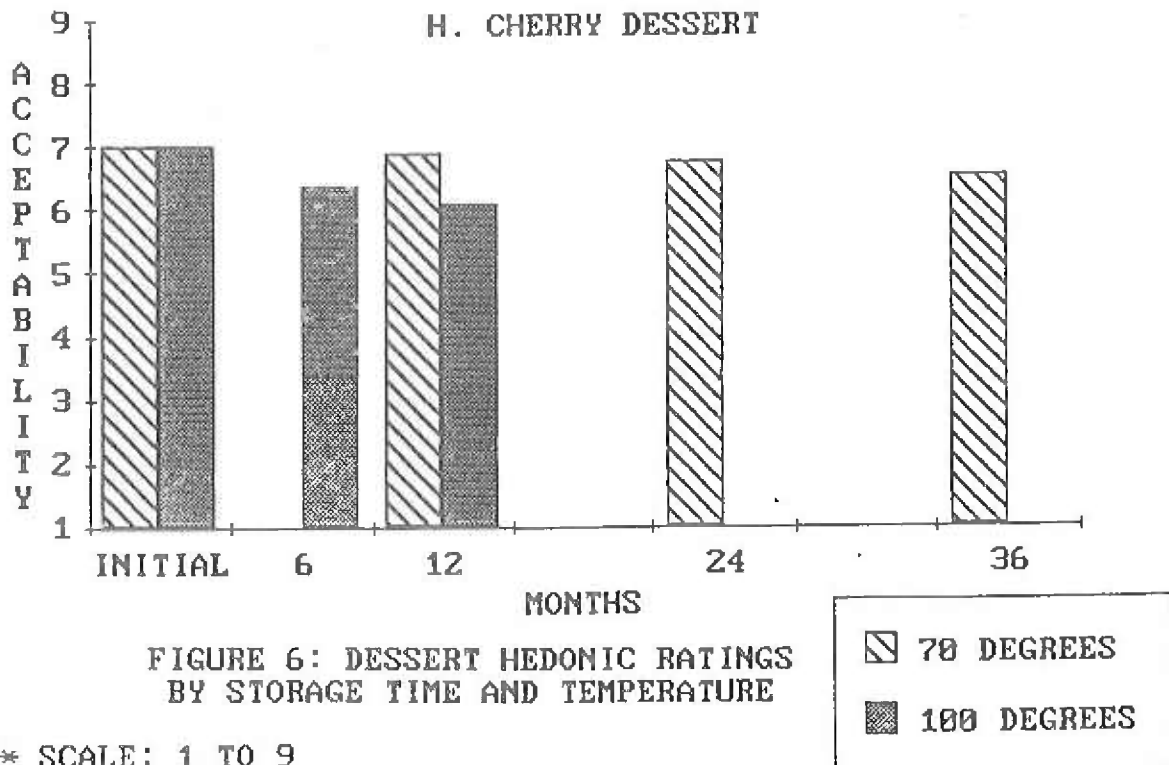
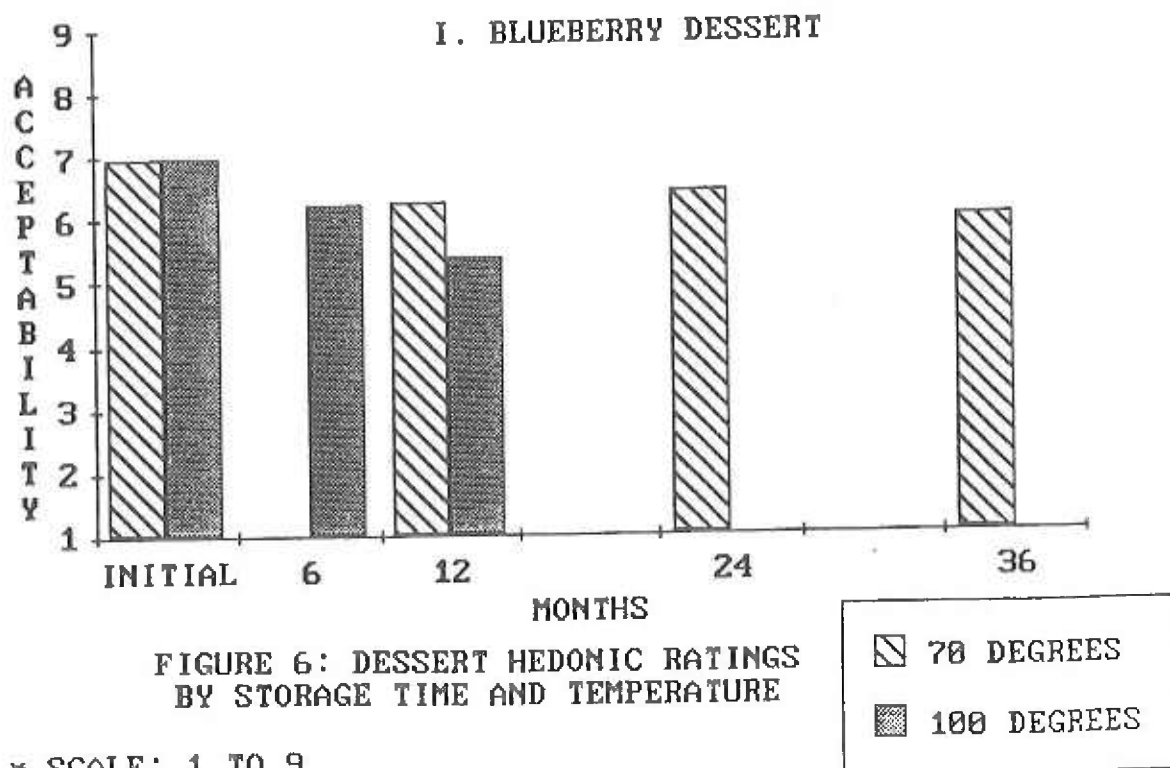


TABLE 6 (con'd)

I. Blueberry Dessert

| <u>Storage/Temp.</u> | <u>Mean Ratings*</u> | <u>Standard Dev.</u> | <u>N</u> |
|----------------------|----------------------|----------------------|----------|
| 0 mo<br>100°F        | 6.99                 | 1.45                 | 144      |
| 6 mo<br>100°F        | 6.23                 | 1.41                 | 152      |
| 12 mo<br>70°F        | 6.26                 | 1.46                 | 144      |
| 12 mo<br>100°F       | 5.37                 | 1.99                 | 152      |
| 24 mo<br>70°F        | 6.40                 | 1.24                 | 152      |
| 36 mo<br>70°F        | 5.97                 | 1.67                 | 152      |



## DISCUSSION AND CONCLUSIONS

For the majority of products tested in this study, Tray Pack acceptability ratings changed significantly over time. This result occurred across all food categories and under both temperature conditions. In the 70°F storage condition, significant differences among mean ratings at 0, 12, 24, and 36 months of storage were found for 38 out of a total of 56 products that remained through the entire period of the study. In the 100°F condition, significant differences existed among ratings at 0, 6, and 12 months for 36 out of 56 products.

Although the effect of time on acceptability was significant for these products, no consistent pattern of change was found overall or within most of the categories. Some products became less acceptable as time progressed. These were meats that were chunked and formed that could create unpleasant changes in texture; starches in an acidic base, which would overpower and mask other flavors; vegetables in a brine, which have a tendency to become softer and exhibit a "woody" or "grassy" offnote; and cakes that become dry and dense in texture over time. Other products became more acceptable. It was noted that items that increased in acceptability had a greater blend of spices such as Chili Con Carne and Lasagna or in the case of vegetables, had a firmer texture initially and a sweet glazing that could mask off flavors. In some cases, ratings followed an inverted 'U' shaped curve and, acceptability first increased and then decreased. This result could be attributed to the initial blending of flavors and then natural degradation of food that occurs over

time. Still other products received acceptability ratings which decreased initially and then increased. There is no apparent reason for these patterns, therefore no conclusion can be drawn.

Only for the dessert products stored at 100°F was some degree of consistency found. In this category, the acceptability of 6 out of 9 products decreased over time.

Another important result in this study was a main effect of temperature on acceptability at 12 months of storage. This occurred with 22 out of a total of 56 products. For the most part, products stored at 70°F were rated significantly higher than those stored at 100°F.

Overall, the products survived very well in storage. Acceptability of all but one product stored under both temperature conditions did not fall below the criterion rating of 5.0 during consecutive withdrawals. This product, sliced carrots, in the 70°F condition, was rated below 5.0 at 24 and 36 month taste tests. This item continued to be tested despite falling below the criterion.

Nine out of a total of 65 Tray Pack items were deleted from further testing. Some of these items were subsequently tested in one of two field studies with military consumers and were dropped because of low acceptability ratings. These field studies were conducted at the same time as the present study but differed because the items were not subjected to the 100°F condition and complete meals were served.

The items that were deleted and the reasons for deletion are as follows:

1 & 2. Orange Nut Cake and Cherry Nut Cake - At 1 year 100°F withdrawal both rated  $x = 5.6$ , which was acceptable. However in 2Q84 both these products were field tested and found unacceptable<sup>8</sup>; as a result the Armed Forces Product Evaluation Committee (AFPEC) decided to delete them.

3. Lima beans - By 2Q86, when tested at 1 year 100°F rated  $x = 5.3$ . This item rated below the acceptability level<sup>9</sup> in a field test and was also rejected by the AFPEC and dropped from further testing.

4. Potatoes in Chicken Sauce rated  $x = 4.5$  initially. Data collected in a field test in 2Q86 concurred with this unacceptable level<sup>9</sup>, and the AFPEC deleted this product.

5. Fruit Cake was field tested during 4Q85 and found to be unacceptable<sup>8</sup>. It was not a popular item with the younger soldiers who felt it was too heavy and inappropriate as a dessert item. It was deleted from the program.

6 & 7. Eggloaf with cheese and Eggloaf with mushrooms were both field tested during 1Q84 and found to be clearly unacceptable<sup>8</sup>. Both products had unresolvable problems with excess free water in the finished



product making them undesirable and unappetizing. The first eggloaf had a bitter cheese flavor. For these reasons they were deleted.

8. Three Bean Salad was dropped from the program due to its acidic nature which at the time blistered and peeled the interior coating of the can and did not allow any shelf stability.

9. Blueberry Cake rated  $x = 4.1$  at 1 year 100° and was deleted as a result of its poor acceptability. This was due in part to a problem with the dye pigment nuggets leaching into the cake causing discolorations. A new process using lake pigment nuggets to stabilize the coloring is being considered and a new product may be tested in the future<sup>10</sup>. During the course of the study the following items required significant reformulation, which resulted in improved overall quality: noodles in butter sauce, frankfurters in brine, macaroni and cheese, escalloped potatoes, glazed sweet potatoes, chocolate nut cake, chocolate pudding, white rice, cherry dessert, blueberry dessert, creamed ground beef, Spanish rice, and breakfast bake.

The implication of these results is that certain Tray Pack products are able to maintain their required levels of acceptability for three years under 70°F storage conditions and/or for one year under 100°F conditions. Additionally, since a number of products received favorable ratings during their final taste test, it is possible that some products may survive even longer storage periods than they were tested under in the present study. This possibility remains to be investigated in future Tray Pack storage research.

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## APPENDICES

- A. Nine-Point Hedonic Rating Scale
- B. Initial Salient Characteristics of Tray Pack Products Tested
- C. Sample of Voluntary Consumer Comments
- D. Fifty-six Tray Pack Products

APPENDIX A - NINE POINT HEDONIC RATING SCALE

|                             |   |
|-----------------------------|---|
| LIKE<br>EXTREMELY           | 9 |
| LIKE<br>VERY MUCH           | 8 |
| LIKE<br>MODERATELY          | 7 |
| LIKE<br>SLIGHTLY            | 6 |
| NEITHER LIKE<br>NOR DISLIKE | 5 |
| DISLIKE<br>SLIGHTLY         | 4 |
| DISLIKE<br>MODERATELY       | 3 |
| DISLIKE<br>VERY MUCH        | 2 |
| DISLIKE<br>EXTREMELY        | 1 |

COMMENTS:

APPENDIX B  
INITIAL SALIENT CHARACTERISTICS OF TRAY PACK PRODUCTS TESTED

ITEM: BEEF STEW

NSN: 8940-01-009-7993

ITEM SPECIFICATION: MIL-B-44294

APPROX CALORIES/SERVING: 250

CHARACTERISTICS OF ITEM:

APPEARANCE: Slightly irregular beef chunks (about 1" in size); potato chunks (1" to 1-1/2" ); carrot slices; round green peas in a thickened gravy containing meat fines, onion pieces and seasoning specks. Color profile: Medium brown gravy and beef; tan potatoes; orange carrots; olive green peas.

ODOR: Typical of a vegetable stew with a slight thermally processed beef aroma.

FLAVOR: Blend of slightly thermally processed beef, carrots, potatoes, and peas in a low salt, lightly seasoned beef-vegetable gravy.

TEXTURE: Beef texture varies from tender to slightly chewy to slightly stringy. Potatoes are slightly firm, carrots soft to mushy, peas are soft, gravy is smooth and thick.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Variations in appearance may occur, depending on date of pack (DOP) and vendor.

ODOR: Canned beef and vegetable odor.

FLAVOR: Some flavor loss may occur.

TEXTURE: The beef may become drier and chewy and the vegetables may become softer and/or mushy.

YIELD: 12 portions of 1 cup each

ITEM: BEEF IN BBQ SAUCE

NSN: 8940-01-010-0881

ITEM SPECIFICATION: MIL-B-44224

APPROX CALORIES/SERVING: 242

CHARACTERISTICS OF ITEM:

APPEARANCE: Small pieces of shredded beef in a medium thick sauce with spice flecks. Color profile: Beef is brown and sauce is dark red.

ODOR: Slightly sweet, smoky, and spicy combined with a cooked beef aroma.

FLAVOR: Slightly sweet, smoky and moderately spicy combined with a cooked beef flavor. The spices cause a slight "spice burn".

TEXTURE: The beef pieces/shreds are chewy and the sauce is medium thick.

ESTIMATED SHELF LIFE AT 70 DEGREES F. 36 months

EXPECTED DETERIORATIVE CHANGE:

APPEARANCE: Expect the sauce to become slightly darker as product ages.

ODOR: Stale, sour, rancid, musty, or moldy.

FLAVOR: Expect a slight loss of BBQ flavor and slight rancidity.

TEXTURE: Expect the beef pieces/shreds to become slightly tougher, drier and chewy.

YIELD: 18 servings of 2/3 cups each

ITEM: BEEF STRIPS WITH GREEN PEPPERS AND GRAVY

NSN: 8940-01-123-2191

ITEM SPECIFICATION: MIL-B-44228

APPROX CALORIES/SERVING: 204

CHARACTERISTICS OF ITEM:

APPEARANCE: Varied sized strips of beef, small green pepper dices and meat fines in a thin sauce. Surface is slightly oily. Color profile: Medium brown meat, olive green peppers in a light brown sauce.

ODOR: Heat processed beef and green peppers.

FLAVOR: Typical of heat processed beef and green peppers, however there is a slightly bitter and salty taste.

TEXTURE: Beef is tender, yet slightly chewy while the sauce is thin and smooth.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Expect a slight thinning of the gravy.

ODOR: Green pepper odor will become slightly stronger.

FLAVOR: Slight bitterness (due to the peppers) may occur and a slight canned beef flavor may be expected.

TEXTURE: Beef will become slightly drier, and more chewy.

YIELD: 18 servings of 2/3 cup each

ITEM: BEEF ROAST, CHUNKED AND FORMED WITH MUSHROOM GRAVY

NSN: 8940-01-150-2857

ITEM SPECIFICATION: MIL-B-44286

APPROX CALORIES/SERVING: 199

CHARACTERISTICS OF ITEM:

APPEARANCE: Oval slices (3 3/4" x 1 1/2" x 3/8") of formed beef with scalloped edges, a few mushroom slices, in a medium gravy with some meat specks. Color profile: Varying tan to dark brown beef, light to medium brown mushrooms, in a light golden brown meat sauce. Interior of the meat may be reddish-brown.

ODOR: Typical of thermally processed beef.

FLAVOR: Typical of thermally processed beef, moderately salty.

TEXTURE: Tender, slightly stringy and chewy beef in a moderately thick sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken; slices may become unshingled.

ODOR: Product may take on a canned beef odor.

FLAVOR: Product may exhibit some flavor loss and a slight canned beef flavor can be expected.

TEXTURE: Beef may become drier and more stringy.

YIELD: 18 servings of 2 slices each



ITEM: MEATLOAF WITH MUSHROOM GRAVY

NSN: 8940-01-151-6919

ITEM SPECIFICATION: MIL-M-44345

APPROX CALORIES/SERVING: 248

CHARACTERISTICS OF ITEM:

APPEARANCE: Slices of ground beef meatloaf containing small onion, pepper, and celery pieces, covered by a medium thick gravy. Some gravy lumps and oil syneresis will be noted. Color profile: Medium brown meat and gravy with olive green vegetables. Gravy is slightly tomato colored.

ODOR: Odor of heat processed meat/bread item with a slight tomato and spice aroma.

FLAVOR: A slightly sweet and salty cooked meat with blended spices. There is a slightly noticeable tomato, onion, and mushroom flavor.

TEXTURE: Soft, compact, slightly chewy meat; smooth sauce; and tender mushroom slices.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Gravy may break down and oil off.

ODOR: Product may exhibit a canned beef odor.

FLAVOR: Product may lose some flavor and/or become bland, slightly scorched or bitter.

TEXTURE: Product may become softer and slices may become unshingled.

YIELD: 18 portions of 2 slices each

ITEM: BEEF, GROUND, CREAMED, ARTIFICIALLY WHITENED

NSN: 8940-01-151-5845

ITEM SPECIFICATION: MIL-B-44337

APPROX CALORIES/SERVING: 331

CHARACTERISTICS OF ITEM:

APPEARANCE: Medium ground beef dispersed in medium thick, glossy sauce, some yellow fat on surface. Color profile: Brown meat in a tan sauce (old version) or a creamy white sauce (new version).

ODOR: Slightly spicy, slightly cooked beef, slightly cooked milk.

FLAVOR: Slightly salty, mildly seasoned cream sauce, and cooked beef.

TEXTURE: Smooth, medium thick sauce; slightly chewy, tender ground beef.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken in color and may oil-off.

ODOR: Stale.

FLAVOR: Product may take on a cooked milk flavor and become bland (loss of spice flavor) or stale.

TEXTURE: Beef may toughen slightly; sauce may become thicker or thinner.

Was reformulated in 1986 to have a whiter, more creamy tasting sauce.

YIELD: 18 portions of 2/3 cup each

ITEM: CHILI CON CARNE

NSN: 8940-01-151-5462

ITEM SPECIFICATION: MIL-C-44244

APPROX CALORIES/SERVING: 504

CHARACTERISTICS OF ITEM:

APPEARANCE: Thick mixture of cooked ground beef, tomato sauce and onion. May have a slight oiling off of fat.  
Color profile: Orange-red-brown.

ODOR: Slight to moderate chili spices, very slight cooked tomato.

FLAVOR: Slightly sweet, slight cooked tomato, cooked ground beef, slight to moderate chili spices, slight to moderate chili burn.

TEXTURE: Chewy ground beef in a thick sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Slight to moderate oiling off; slight product darkening.

ODOR: Slightly bitter with a stronger spice and tomato odor.

FLAVOR: Product may exhibit some flavor loss.

TEXTURE: A slight thinning off of the sauce may occur, with moderate oiling off of the fat. Ground meat may become chewy.

YIELD: 12 portions of 1 cup each

ITEM: BEEF AND CARROTS IN GRAVY

NSN: 8940-01-123-1584

ITEM SPECIFICATION: MIL-B-44229

APPROX CALORIES/SERVING: 317

CHARACTERISTICS OF ITEM:

APPEARANCE: Somewhat irregular shaped 1/4" meat slices (cut against the grain); a few cooked carrots; au jus type gravy with finely dispersed oil droplets; meat fines; and spices. Color profile: light brown meat with luminescence and some charred edges, dark orange carrots, dark red tomato pieces, and a clear golden brown gravy.

ODOR: Cooked pot roast with a slight vegetable aroma.

FLAVOR: Moist cooked pot roast and pot roast gravy, slight cooked carrot and slight tomato flavor.

TEXTURE: Chewy, tender beef, tender soft carrots, thin gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Carrots may appear broken; slices may become unshingled.

ODOR: Product may exhibit a canned beef odor.

FLAVOR: Product may lose some of its characteristic flavor and develop a canned meat flavor.

TEXTURE: Meat may become tough, stringy and dry. Carrots may become even softer or mushy.

YIELD: 12 portions of 3 slices each, gravy and 2 pieces of carrot

ITEM: MEATBALL, SWEDISH, WITH BROWN GRAVY

NSN: 8940-01-123-1585

ITEM SPECIFICATION: MIL-M-44316

APPROX CALORIES/SERVING: 274

CHARACTERISTICS OF ITEM:

APPEARANCE: Round, slightly irregular meatballs, app. 1-1/2" to 2" in diameter. Slightly thickened fluid gravy with oil droplets. Interior of meatball has appearance of fine to medium ground meat. Color profile: Medium brown meatballs in a yellow-tan gravy. Interior of meatballs has a reddish tinge which dissipates upon exposure to air.

ODOR: Mildly seasoned (allspice) cooked meatballs with a seasoned gravy aroma.

FLAVOR: Slight to moderate salt with a seasoned meatball in gravy (allspice) flavor.

TEXTURE: Very tender, dense meatballs in a smooth thin gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Gravy may break down and oil-off and/or darken.

ODOR: Product may exhibit a canned beef odor.

FLAVOR: Some flavor loss may occur with the product becoming bland.

TEXTURE: Gravy may become thinner, with some gel lumps present.

YIELD: 12 servings of 2 meatballs each

ITEM: PEPPERS, GREEN, HALVES, STUFFED WITH BEEF AND RICE IN SAUCE

NSN: 8940-01-151-6913

ITEM SPECIFICATION: MIL-B-44224

APPROX CALORIES/SERVING: 231

CHARACTERISTICS OF ITEM:

APPEARANCE: Sliced pepper halves stuffed with ground beef and plump rice covered by a thin tomato sauce. Oil syneresis will be noted in the sauce.  
Color profile: olive green peppers, brown meat, off-white rice, red tomato sauce, yellow oil.

ODOR: Fully cooked green pepper, starchy rice, slightly cooked tomato, slightly cooked beef.

FLAVOR: Cooked green pepper, slightly cooked tomato, slightly starchy rice, slightly salty, and a slight cooked beef flavor.

TEXTURE: Soft, mushy green pepper with chewy skin; crumbly, tender beef; soft rice; and a thin, smooth, slightly oily sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Peppers may darken and collapse slightly; sauce may appear darker in color.

ODOR: Green pepper odor may become slightly stronger.

FLAVOR: With overall product, some flavor loss may occur. Product may become bland or it may become bitter due to the green peppers.

TEXTURE: Peppers may become softer, and outer skin may be chewy. Stuffing may become moderately firmer.

YIELD: 12 servings of 1 stuffed pepper half each.

ITEM: SPAGHETTI W/MEATBALLS AND SAUCE

NSN: 8940-01-151-6921

ITEM SPECIFICATION: MIL-S-44341

APPROX CALORIES/SERVING: 257

CHARACTERISTICS OF ITEM:

APPEARANCE: Round, slightly irregular meatballs and plump pieces of spaghetti with a thick sauce containing a few black pepper specks. Color profile: Cream colored spaghetti, dark brown meatballs, and a light red-orange sauce.

ODOR: Typical of a fully cooked pasta product containing tomato, beef and herbs.

FLAVOR: Typical of a fully cooked pasta product containing tomato, beef and herbs. A slight salt aroma is noticeable.

TEXTURE: Soft, densely packed pasta which is slightly dry. Inspectors will notice a low sauce level in relation to the amount of pasta.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Expect little or no change in appearance; may darken slightly.

ODOR: May exhibit a slight loss of spice aroma.

FLAVOR: Meatballs may become slightly dry and/or bland; slight loss of spice flavor; very slight bitter tomato flavor.

TEXTURE: Spaghetti may become softer.

Spaghetti is initially soft after retorting but firms up during storing.

YIELD: 12 servings of 1 cup each (each serving shall include 2 meatballs)

ITEM: BEEF TIPS WITH GRAVY

NSN: 8940-01-173-2427

ITEM SPECIFICATION: MIL-B-44230

APPROX CALORIES/SERVING: 211

CHARACTERISTICS OF ITEM:

APPEARANCE: Varying sized chunks of beef covered by a medium thick gravy with meat fines. Color profile: Brown meat in a orange-brown gravy with spice specks.

ODOR: Cooked beef with a slight spicy aroma.

FLAVOR: Cooked beef, slightly salty, slightly spicy.

TEXTURE: Tender, chewy, slightly stringy beef; smooth thickened gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Gravy may become thinner.

ODOR: Product may exhibit canned beef odor.

FLAVOR: Product may become bland and have a canned beef flavor.

TEXTURE: Meat may become slightly chewy and dry.

YIELD: 18 portions of 2/3 cup each



ITEM: MACARONI WITH BEEF AND SAUCE

NSN: 8940-01-173-2428

ITEM SPECIFICATION: MIL-M-44331

APPROX CALORIES/SERVING: 263

CHARACTERISTICS OF ITEM:

APPEARANCE: Mixture of cooked elbow macaroni and ground beef with peppers, tomatoes, onions, celery, and spice specks. Color Profile: Off-white macaroni with reddish coating, brown ground beef, olive green celery and peppers, red tomatoes, and translucent onions.

ODOR: Typical of cooked beef and tomato with slight aroma of peppers, spices, and herbs.

FLAVOR: Primarily that of a cooked tomato pasta product with a slight pepper, spice, and herb taste.

TEXTURE: Soft macaroni, crumbly ground beef, and tender vegetables.

EST SHELF LIFE AT 70 DEGREES F: 36 months

DEFECTS LIKELY TO OCCUR:

APPEARANCE: Product may darken slightly.

ODOR: Product will exhibit a slight loss of spice aroma.

FLAVOR: Overall product may become more bland.

TEXTURE: Macaroni may become even softer.

Macaroni is initially soft but becomes firmer during the first months of storage.

YIELD: 12 servings of 1 cup each

ITEM: BEEF SWISS STEAK WITH GRAVY

NSN: 8940-01-151-4185

ITEM SPECIFICATION: MIL-B-44227

APPROX CALORIES/SERVING: 310

CHARACTERISTICS OF ITEM:

APPEARANCE: 3/8" Thick beef slices (some edged with fat) in a slightly oily gravy containing chopped onion pieces, tomato pieces, meat fines, and black pepper specks.  
Color profile: Light dark brown meat surfaces, translucent onion, and a tan gravy.

ODOR: Typical of heat processed beef and onions in a beef broth.

FLAVOR: Slight to moderate salt, heat processed beef, vary slight oil, in a very slight beef broth flavor.

TEXTURE: Chewy, slightly stringy beef, and a smooth medium thick gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly; gravy may become thicker or thinner.

ODOR: Product may exhibit canned beef odor.

FLAVOR: Product may experience some flavor loss and become slightly bitter.

TEXTURE: Meat may become slightly drier, chewy and/or tough.

YIELD: 12 portions of 1 steak each

ITEM: LASAGNA W/MEAT SAUCE

NSN: 8940-01-124-4544

ITEM SPECIFICATION: MIL-L-44333

APPROX CALORIES/SERVING: 361

CHARACTERISTICS OF ITEM:

APPEARANCE: Four layers of fluted lasagna noodles alternatively layered with thick tomato-meat sauce and a pasty, slightly oily cheese mixture. The layers are topped with the tomato-meat sauce. Color profile: Cream colored noodles, red-brown meat sauce, pale orange-tan cheese filling.

ODOR: Canned tomato aroma, with the presence of slight cooked pasta, thermally processed cheese, and spice blend aromas.

FLAVOR: Typical of thermally processed pasta and a tomato beef sauce with a cooked cheese, slight salt, and slight spice-herb blend taste.

TEXTURE: Soft cooked pasta, soft fine curd cheese, with small cooked ground meat pieces.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Cheese filling may become tan colored; sauce tends to be absorbed into noodles.

ODOR: Slight scorched milk odor.

FLAVOR: Cheese may develop a slightly scorched milk flavor. It may become drier tasting and pasty.

TEXTURE: May develop and overall slight dryness due to sauce absorption.

YIELD: 12 servings cut 3 rows x 4 rows

ITEM: MEATBALLS W/RICE IN TOMATO SAUCE AND CABBAGE

NSN: 8940-01-173-2432

ITEM SPECIFICATION: MIL-M-44310

APPROX CALORIES/SERVING: 242

CHARACTERISTICS OF ITEM:

APPEARANCE: Dense mix of fine ground beef and kernels of rice in meatballs form covered with a moderate amount of moderately thick sauce containing shredded cabbage. Color Profile: Gray-brown beef, off-white rice, light-tan cooked cabbage. Sauce is slight glossy orange-red.

ODOR: Typical of heat processed beef and cabbage. There is a slight sweet, slight spice, and slight rice odor with a moderate tomato aroma.

FLAVOR: Typical of heat processed beef and cabbage with a moderate cooked rice and tomato flavor. There is also a slight pepper, salt, and sweet flavor noticeable.

TEXTURE: Slightly firm beef, soft rice, tender shredded cabbage leaves in a medium thick smooth sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly.

ODOR: Product may exhibit a canned beef odor.

FLAVOR: Product may exhibit a slightly stronger cabbage and tomato flavor; slight bitterness.

TEXTURE: Cabbage may become softer and break up.

YIELD: 12 servings of 2 meatballs and 1/3 cup cabbage and sauce each

ITEM: FRANKFURTERS IN BRINE

NSN: 8905-010-124-8628

ITEM SPECIFICATION: MIL-F-44297

APPROX CALORIES/SERVING: 244

CHARACTERISTICS OF ITEM:

APPEARANCE: Outer surface: Smooth, intact skin with some links containing narrow splitlike impressions in the casing. Inside surface: Compact, emulsified meat. Color profile: Slightly matted outer surface that is dark reddish-brown with black pepper specks. Inner surface is light pink tan.

ODOR: Smoky, spicy, and briny.

FLAVOR: Frankfurters are highly salty, slightly smoky, slightly spicy, with a black pepper flavor. Flavor closely resembles a vienna sausage product.

TEXTURE: Moist, moderately soft interior with soft outer surface; may be slightly mushy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may become darker; brine may be slightly cloudy and reddish-tan in color.

ODOR: Product may become slightly stale.

FLAVOR: Product may become slightly stale or rancid.

TEXTURE: Product may become even softer.

SPECIAL NOTES: Size of frankfurters may vary with dates of pack. Franks soften due to retorting. Brine formulation was changed to reduce the high salty flavor, but saltiness is still evident.

YIELD: 18 portions of 3 frankfurters each.

ITEM: CHICKEN SLICES IN GRAVY

NSN: 8940-01-153-8540

ITEM SPECIFICATION: MIL-C-44246

APPROX CALORIES/SERVING: 248

CHARACTERISTICS OF ITEM:

APPEARANCE: Formed chicken slices (approx. 3 3/4"x 2" x 5/16") with scalloped edges in thin fluid gravy with oil droplets. Color profile: The formed chicken is composed of both dark and white meat and gravy is light to dark tan in color.

ODOR: Aroma of the heat processed chicken.

FLAVOR: Slightly salty combined with the flavor of a typical heat processed chicken and chicken broth.

TEXTURE: Tender, formed chicken in a thin fluid gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Slight breakdown of gravy with oiling off.

ODOR: Slightly stale with a canned chicken aroma.

FLAVOR: Slightly rancid or stale. Slight flavor loss is expected with a development of a slight canned chicken flavor.

TEXTURE: Slightly dry, chewy chicken slices.

YIELD: 18 servings

ITEM: CHICKEN ALA KING

NSN: 8940-01-154-3525

ITEM SPECIFICATION: MIL-C-44289

APPROX CALORIES/SERVING: 248

CHARACTERISTICS OF ITEM:

APPEARANCE: Smooth, moderately thick sauce containing variable sized chicken pieces and small pimiento, celery, green pepper, peas, and mushroom pieces. A few specks of seasoning will be noticeable. Color profile: tan sauce; varying light to darker brown chicken pieces; olive green celery; green peppers and peas; and red pimiento.

ODOR: Typical of cooked chicken.

FLAVOR: Typical of cooked chicken in a mildly seasoned sauce with a slightly salty taste.

TEXTURE: Tender chicken and soft vegetables in a smooth creamy sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Sauce may darken and become thinner, thicker or pasty.

ODOR: Product may become stale with a loss of chicken and/or spice aroma.

FLAVOR: Some flavor loss is expected; slightly stale with a slight canned chicken flavor.

TEXTURE: Chicken will become slightly drier, tougher and chewy.

YIELD: 12 portions of 1 cup each

ITEM: CHICKEN STEW

NSN: 8940-01-173-2430

ITEM SPECIFICATION: MIL-C-44288

APPROX CALORIES/SERVING: 285

CHARACTERISTICS OF ITEM:

APPEARANCE: Irregular chicken dices, distinct potato dices, whole and broken small green peas, small carrot dices, celery pieces, vegetable fines, with spice specks in a thick sauce. Color profile: Light to dark tan chicken, off-white potato, bright orange carrots, olive green peas and celery, dark spice specks, and a tan sauce.

ODOR: Aroma of cooked chicken; heat processed potatoes, carrots, and milk; combined with a spice blend aroma (black pepper, sage, thyme, and other spices).

FLAVOR: Typical of a heat processed chicken, cooked milk, with a slight pepper, potato, and a sweet spice flavor.

TEXTURE: Chicken is chewy but tender, potato is firm, peas are soft and starchy, carrots are soft, and sauce is smooth and thick.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Excessively thick or thin sauce.

ODOR: Slightly stale and/or a canned chicken aroma.

FLAVOR: Some overall flavor loss is expected and a canned chicken flavor may be exhibited.

TEXTURE: Slightly drier, chewy meat. Vegetables may be softer and mushy.

YIELD: 12 portions of 1 cup each



ITEM: CHICKEN BREASTS IN GRAVY

NSN: 8940-01-173-4839

ITEM SPECIFICATION: MIL-C-44295

APPROX CALORIES/SERVING: 310

CHARACTERISTICS OF ITEM:

APPEARANCE: Skinned chicken breasts covered by a medium thick gravy. Color profile : Chicken meat is an off-white with a tan-cream gravy with black spice specks.

ODOR: Aroma of cooked chicken and chicken broth with a slight salt and spicy aroma.

FLAVOR: Typical of canned chicken and chicken broth with a slight salt and spicy flavor.

TEXTURE: Chewy, but tender with the chicken being slightly firm and stringy. Gravy is smooth and of a medium thickness.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Thinning of the gravy; gravy may breakdown slightly and oil off.

ODOR: Slightly stale or a canned chicken aroma.

FLAVOR: Flavor loss(blandness) may occur as product ages; slight canned chicken flavor may be present.

TEXTURE: Dry, stringy or chewy chicken; lumpy or thinner gravy.

Expect stringiness as this is a whole muscle product.

YIELD: 12 servings (1 breast plus approximately 4 ounces gravy per serving)

ITEM: CHICKEN AND NOODLES

NSN: 8940-01-173-2431

ITEM SPECIFICATION: MIL-C-44364

APPROX CALORIES/SERVING: 313

CHARACTERISTICS OF ITEM:

APPEARANCE: Soft, flat noodles, irregular chicken dices (appr. 1/2"), and mushroom pieces covered by a moderately thick sauce. Color profile: noodles are off-white, mushrooms are medium to dark tan, sauce is orange-golden, and light and dark chicken is used.

ODOR: Typical of heat processed chicken and chicken broth combined with a cooked pasta.

FLAVOR: Typical of heat processed chicken and chicken broth with cooked pasta and mushrooms. Additionally there is a slight cheese and very slight salt flavor.

TEXTURE: Pasta is moderately soft and slightly gummy, chicken is tender, mushrooms are firm, and sauce is smooth and thick.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Excessively thick or thin sauce. Some "gel" clumps of starch may be seen on the surface of the noodles. Noodle color may fade.

ODOR: Slightly starchy with a canned chicken odor.

FLAVOR: Slightly stale, starchy noodles; canned chicken flavor.

TEXTURE: Chicken dices may be slightly dry, chewy or tough. Mushrooms and noodles may be softer.

YIELD: 12 servings (1 cup per serving)

ITEM: CHICKEN CACCIATORE

NSN: 8940-01-173-2429

ITEM SPECIFICATION: MIL-C-44328

APPROX CALORIES/SERVING: 282

CHARACTERISTICS OF ITEM:

APPEARANCE: Mixture of various sized chicken dieces, sliced mushrooms, small pieces of green pepper and onions, and chicken shreads and fines - thick sauce. Color profile: tan chicken, gray-brown mushrooms, olive green peppers, translucent onions, and a tan-orange-brown sauce.

ODOR: Predominantly cooked chicken with a slight combined aroma of mushroom, tomato, and blended spices.

FLAVOR: Typical of cooked chicken with a slight mushroom, tomato, spice blend, and herb taste.

TEXTURE: Chicken is slightly dry and stringy but tender. Mushrooms are firm and the sauce is thick.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Very thin or dry, pasty sauce; product color may darken.

ODOR: Slight canned chicken aroma.

FLAVOR: Slight flavor loss may be expected; slight bitterness to the sauce; slight canned chicken flavor.

TEXTURE: Slightly dry, chewy chicken dices.

YIELD: 12, 1 cup servings

ITEM: TURKEY SLICES W/GRAVY

NSN: 8940-01-143-3328

ITEM SPECIFICATION: MIL-t-44237

APPROX CALORIES/SERVING: 245

CHARACTERISTICS OF ITEM:

APPEARANCE: Thin gravy with oil droplets over formed turkey slices (appr. 4 1/4" x 1 3/4" x 3/16"). Color profile: Gravy is light brown while turkey slices are cream colored with dark grey-brown areas.

ODOR: Aroma is typical of a slightly heat processed turkey item combined with a brothy, mildly seasoned gravy.

FLAVOR: Flavor normally associated with a thermally processed turkey and gravy with a slight salty and seasoned taste. Slight canned turkey flavor is expected.

TEXTURE: Tender turkey slices in a medium thin gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Thinning of the gravy.

ODOR: Slightly stale; canned turkey aroma.

FLAVOR: Slightly stale; canned turkey flavor.

TEXTURE: A slightly drier and chewy texture is expected.

YIELD: 18 servings of 4 slices each

ITEM: BACON, CANADIAN STYLE SLICED, IN BRINE

NSN: 8905-01-151-2488

ITEM SPECIFICATION: MIL-B-44232

APPROX CALORIES/SERVING: 139

CHARACTERISTICS OF ITEM:

APPEARANCE: Moist surface with dark casing and possibly a thin band of fat

COLOR PROFILE: Light to medium pinkish tan, with tan to reddish-brown casing

ODOR: Briny with a slight cured pork (ham) aroma

FLAVOR: Typical of cured ham: salty with a slight smokey flavor.

TEXTURE: Tender, friable.

ESTIMATED SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Products, may become darker. Brine may become slightly cloudy. Slices may become unshingled and tend to break up.

ODOR: Product may become stale.

FLAVOR: Slightly stale. Product may taste saltier.

TEXTURE: Product may become dry and stringy.

YIELD: 18 portions of 3 slices each

ITEM: PORK SAUSAGE LINKS IN BRINE

NSN: 8905-01-151-6920

ITEM SPECIFICATION: MIL-P-44311

APPROX CALORIES/SERVING: 313

CHARACTERISTICS OF ITEM:

APPEARANCE: Approximately 3" x 1/2" cylindrical sausage links with an irregular, oily surface. Casings are not apparent. Interior is that of a compact, ground meat. Color profile: exterior pale, mottled grayish tan with a variable amount of golden brown grill marks. Interior is mottled pinkish tan with pink color slowly dissipating.

ODOR: Cooked pork with a slightly sweet and mildly spicy aroma.

FLAVOR: Typical of mildly seasoned cooked pork sausage. A moderate to high fatty, moderately salty, slightly sweet taste is noticeable.

TEXTURE: Links are soft, tender, and slightly mushy with a moist interior. A fatty mouth feel is noticeable.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Surface may become greasy and shiny.

ODOR: Product may become slightly stale or rancid.

FLAVOR: Slightly stale or rancid. Product may become bland.

TEXTURE: Links may become softer with some sloughing of the casing.

YIELD: 18 portions of 5 links each

ITEM: PORK SLICES WITH GRAVY

NSN: 8940-01-010-4843

ITEM SPECIFICATION: MIL-P-44233

APPROX CALORIES/SERVING: 265

CHARACTERISTICS OF ITEM:

APPEARANCE: Formed Pork Slices (4" X 1-3/4" X 1/4") with a few small voids and scalloped edges. Gravy is thin with oil droplets, a few meat fines, and small onion pieces. Color profile: Varying light to dark tan meat in a pale yellow-tan gravy.

ODOR: Typical of thermally processed pork.

FLAVOR: Typical of thermally processed pork being slightly salty. Gravy is also salty leaving an oily mouth coating.

TEXTURE: Tender mealy meat in a thin gravy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: A film of fat may appear on the top surface of the canned product; gravy may become even thinner.

ODOR: Product may exhibit a slightly stronger canned pork aroma, may become slightly stale or rancid.

FLAVOR: Product may taste fatty and/or develop an oxidized, stale flavor.

TEXTURE: Pork may become dry and chewy.

YIELD: 18 portions of 3 slices each

ITEM: PORK IN BARBECUE SAUCE

NSN: 8940-01-151-6918

ITEM SPECIFICATION: MIL-P-44326

APPROX CALORIES/SERVING: 389

CHARACTERISTICS OF ITEM:

APPEARANCE: Product will appear as brown red meat pieces and fines, with an excess amount of dark red oil.

ODOR: Slightly smokey and tomato; cooked pork odor.

FLAVOR: Slightly sweet and smoked pork; very slight tomato flavor.

TEXTURE: Slightly stringy, chewy meat texture with an oily consistency.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product will exhibit a moderate surface oil which should reincorporate on mixing.

ODOR: Slightly bitter, stronger tomato and smoke aroma.

FLAVOR: Slightly bitter or stale flavor.

TEXTURE: Meat pieces may become more broken or mushy.

YIELD: 18 servings of 2/3 cups each



ITEM: HAM SLICES

NSN: 8905-01-143-3326

ITEM SPECIFICATION: MIL-B-44298

APPROX CALORIES/SERVING: 139

CHARACTERISTICS OF ITEM:

APPEARANCE: Rectangular preformed ham slices (3-3/4" x 2" x 1/4"). Color profile: Pink slices with a few darker red areas, white fat pockets, and tan-red edges.

ODOR: Typical of thermally processed ham: briny and slightly smoky.

FLAVOR: Typical of thermally processed ham: moderately salty with a slight smoke flavor.

TEXTURE: Tender, friable ham.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken and brine may become slightly cloudy.

ODOR: Product may become slightly stale.

FLAVOR: Product may have a slightly stale or rancid flavor.

TEXTURE: Ham may become dry and stringy.

The brine formulation was changed in 1986 to make the product less salty; however, it is still salty to taste.

YIELD: 18 portions of 2 slices each

ITEM: ESCALLOPED POTATOES

NSN: 8940-01-147-6362

ITEM SPECIFICATION: MIL-E-44231

APPROX CALORIES/SERVING: 119

CHARACTERISTICS OF ITEM:

APPEARANCE: Round 1/4 inch thick diameter slices (diameter may vary) with few black specks, covered with a medium-thick glossy sauce. Color profile: Cream colored potatoes with cream colored sauce and some black pepper specks.

ODOR: Typical of cooked potato with slight cooked milk aroma.

FLAVOR: Cooked potato flavor with a slight salt, starch, and cooked milk flavor.

TEXTURE: Smooth, moderately thick sauce and slightly firm, tender potatoes.

ESTIMATED SHELF LIFE AT 70 DEGREES F: 36 MONTHS

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Potatoes may become slightly darker and the sauce may also darken and become thicker.

ODOR: Product may become slightly sour or exhibit a scorched aroma.

FLAVOR: Slightly sour, bland or scorched.

TEXTURE: Potato texture may become mushy, hard, or fibrous. Sauce may become thicker or thinner.

YIELD: 18 servings of 2/3 cup each. A few dark portions may be seen inside some of the potato slices and is expected.

ITEM: MACARONI AND CHEESE

NSN: 8940-01-150-2860

ITEM SPECIFICATION: MIL-M-44342

APPROX CALORIES/SERVING: 216

CHARACTERISTICS OF ITEM:

APPEARANCE: Smooth, creamy, thick cheese sauce over plump elbow macaroni pieces. Color profile: Light to medium yellow-orange.

ODOR: Heat processed milk with a slight cheese aroma.

FLAVOR: Heat processed milk, sharp cheese, and a slightly starchy taste.

TEXTURE: Soft cooked macaroni combined with a thick, starchy cream cheese sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Sauce may become slightly darker yellow in color and may appear thicker.

ODOR: Slightly scorched aroma and a slightly stronger cheese odor.

FLAVOR: Macaroni may exhibit a slight flavor loss, however cheese flavor will become stronger (sharper/bitter).

TEXTURE: Macaroni may become moderately softer.

Note: Initially soft becoming firmer during the first months of storage.

YIELD: 18 servings of 2/3 cup each

ITEM: BEANS IN TOMATO SAUCE FLAVORED WITH BACON

NSN: 8915-01-147-7853

ITEM SPECIFICATION: MIL-B-44242

APPROX CALORIES/SERVING: 251

CHARACTERISTICS OF ITEM:

APPEARANCE: Small beans, small bacon pieces, in a medium-thick sauce. Color profile: Medium-brown beans, dark brown bacon pieces, and a red-brown sauce.

ODOR: Typical of sweet molasses type baked beans with a slight smoked baked aroma.

FLAVOR: Sweet, starchy baked beans with a very slight tomato and bacon flavor.

TEXTURE: Soft, tender starchy beans; slightly chewy bacon.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Beans and sauce may become darker in color.

ODOR: Product may become less sweet and smokey in aroma.

FLAVOR: Product may exhibit some overall flavor loss (mainly spice and smoke).

TEXTURE: Beans may become a little bit drier, mushy, or tough.

Size and type of beans may vary with vendor.

YIELD: 18 servings of 2/3 cup each

ITEM: NOODLES, BUTTERED

NSN: 8940-01-151-5844

ITEM SPECIFICATION: MIL-N-44334

APPROX CALORIES/SERVING: 169

CHARACTERISTICS OF ITEM:

APPEARANCE: Soft, flat noodles in a buttered sauce. Color profile: Cream colored noodles covered by golden butter sauce.

ODOR: Typical of heat processed noodles and butter.

FLAVOR: Typical of cooked pasta in butter with slight salt flavor.

TEXTURE: Soft, slightly mushy noodles in a smooth butter sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Noodles will become slightly darker with gray tones; small lumps of starch may appear in the sauce on the noodles; sauce may become thick or pasty.

ODOR: Product may become slightly stale.

FLAVOR: Product may exhibit a slight flavor loss (bland).

TEXTURE: Product may become slightly softer and gummy. Sauce may become pasty.

Yellow color of butter will vary in hue. Restored noodles are initially soft and will firm up while in storage. Expect free butter (oil) on the surface of this product. The free butter will mix back into the product while stirring.

YIELD: 18 servings of 2/3 cup each

ITEM: POTATOES, DICED, IN BUTTER SAUCE

NSN: 8940-01-152-6821

ITEM SPECIFICATION: MIL-P-44234

APPROX CALORIES/SERVING: 146

CHARACTERISTICS OF ITEM:

APPEARANCE: Irregular dices of potatoes covered by a thick glossy sauce, with some butter fat floating free in the sauce. Color profile: off-white potato dices, pale off-white to yellow sauce with the free floating butter fat being yellow.

ODOR: Typical starchy potato odor with a slight butter aroma.

FLAVOR: Cooked potato with a slight salt and a slight heat processed butter flavor.

TEXTURE: Soft potatoes in a thick smooth sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Amount of free floating butterfat may increase; most should reincorporate into sauce on mixing.

ODOR: Product may exhibit a slight scorched aroma.

FLAVOR: Slightly sour or scorched milk; bland sulfurous taste.

TEXTURE: Potatoes may become softer.

YIELD: 18 portions of 2/3 cup each

ITEM: POTATO SALAD

NSN: 8940-01-162-2178

ITEM SPECIFICATION: MIL-P-44267

APPROX CALORIES/SERVING: 199

CHARACTERISTICS OF ITEM:

APPEARANCE: Approximately 1/2" sized dices of potato; 3/8" pieces of celery and green pepper; 1/4" pieces of pimiento and onion; and small pieces of egg tossed in a moderately thick sauce containing potato grains. Color profile: light yellow potato, orange-yellow pimiento, olive green pepper, green celery, translucent onion, light yellow egg yolk, in an off light yellow sauce.

ODOR: Moderate vinegar, moderately sweet, slight to moderate potato, slightly briny, and a slight to moderate egg yolk odor.

FLAVOR: Moderate cooked potato with a moderate sweet vinegar and slightly moderate egg yolk taste. Also noticeable is a slight salt, green pepper, pimiento, celery, and onion flavor.

TEXTURE: Potatoes are firm, slightly grainy; celery, green peppers, and onions are firm; pimiento and egg yolks are soft; sauce is thick and slightly mealy.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly.

ODOR: Product odor may show increased or decreased sharpness.

FLAVOR: Green peppers may become bitter. Product may become slightly more acidic and have a slight overall flavor loss.

TEXTURE: Vegetables may become slightly softer; potatoes may become firmer.

YIELD: 18 portions of 2/3 cup each

ITEM: RICE, WHITE

NSN: 8920-01-151-8019

ITEM SPECIFICATION: MIL-R-44274

APPROX CALORIES/SERVING: 286

CHARACTERISTICS OF ITEM:

APPEARANCE: Shiny, distinct nonclumping rice kernels with light oil on the surface. Color Profile: Rice is off-white, with a slight tan color

ODOR: Heat processed, starchy odor with a slight butter/margarine aroma.

FLAVOR: Starchy, heat processed rice with a moderate oily butter/margarine flavor.

TEXTURE: Tender, slightly chewy rice kernels. Product is slightly oily.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: May lack fluffiness and have fewer distinct grains on the surface when well heated.

ODOR: Product may become slightly stale.

FLAVOR: Acidic flavor may become stronger (old version) or very slightly stale (new version).

TEXTURE: Rice may become slightly dry, hard, mushy, or pasty.

YIELD: 18 portions of 2/3 cup each



ITEM: RICE, SPANISH

NSN: 8940-01-152-0479

ITEM SPECIFICATION: MIL-R-44226

APPROX CALORIES/SERVING: 194

CHARACTERISTICS OF ITEM:

APPEARANCE: Moist, compacted rice kernels with a medium tomato coating, containing green pepper dices, mushroom pieces, and onion pieces. Color profile: Pale red-orange rice with a slight red tomato coating, tan to brown mushroom pieces, olive green pepper dices, and translucent onion pieces.

ODOR: The predominant odor is similar to that of stewed tomatoes and cooked green peppers.

FLAVOR: Moderately starchy rice, slight to moderate stewed tomato, and slight green pepper flavor. Product may be slightly sweet and/or acidic and may be bitter due to the green peppers.

TEXTURE: Soft, mushy rice and green peppers with slightly firm mushrooms.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may become darker.

ODOR: Product may become slightly stale and have a slightly bitter pepper-tomato aroma.

FLAVOR: Slight bitterness due to peppers and tomato.

TEXTURE: Rice may become softer and/or more mushy.

YIELD: 12 portions of 1 cup each

ITEM: MACARONI SALAD

NSN: 8940-01-173-1875

ITEM SPECIFICATION: MIL-M-44335

APPROX CALORIES/SERVING: 259

CHARACTERISTICS OF ITEM:

APPEARANCE: Mixture of cooked elbow macaroni with red peppers, green peppers and celery in a cream sauce. Color profile: Cream-tan colored macaroni with a tan-orange colored dressing (probably due to bleeding of red pepper), olive green celery and peppers.

ODOR: Starchy-vinegar odor, with a slight to moderate green pepper aroma.

FLAVOR: Slight vinegar, starchy flavor; peppers may have a slight to moderate flavor with some bitterness.

TEXTURE: Starchy, gummy macaroni with slightly soft vegetables.

EST SHELF LIFE AT 70 DEGREES F: To be determined.

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Slightly darker color (tannish, off-white), sauce may become thicker and may be absorbed into the macaroni.

ODOR: Slightly stronger green pepper and slight loss of acidic (vinegar) odor.

FLAVOR: Slightly bitter green pepper. Product will have a slight overall flavor (sourness) loss.

TEXTURE: Vegetables will become even softer, macaroni will become firmer and more doughy.

YIELD: 18 servings of 2/3 cup each

Note: No long term storage data are available for this item at this time.

ITEM: BEANS, GREEN

NSN: 8915-01-150-2861

ITEM SPECIFICATION: MIL-B-44245

APPROX CALORIES/SERVING: 26

CHARACTERISTICS OF ITEM:

APPEARANCE: Relatively uniform sliced pieces (approx. 1" in length) of green beans.

ODOR: Slightly sweet, typical of heat processed green beans.

FLAVOR: Slightly sweet with a very slight salt flavor.

TEXTURE: Soft and slightly mushy. (Grade A and B for texture is permitted).

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Beans may lose some of their green color (fading).

ODOR: Slightly bitter, sour.

FLAVOR: Beans may develop a bitter taste and be slightly sour.

TEXTURE: Beans may become very soft/mushy and watery, with some breaking open of the beans and sloughing of the outer shell.

YIELD: 18 portions of 3/4 cup each

ITEM: VEGETABLES, MIXED

NSN: 8915-01-150-2859

ITEM SPECIFICATION: MIL-V-44261

APPROX CALORIES/SERVING: 59

CHARACTERISTICS OF ITEM:

APPEARANCE: Peas, carrot dices, lima beans, corn kernels, and varying sized green beans. Color profile: olive green peas and beans (green and lima); orange-yellow carrots; and yellow corn.

ODOR: Typical of a heat processed vegetable mix.

FLAVOR: Typical of a heat processed vegetable mix with a slightly salty taste.

TEXTURE: Corn is firm and slightly chewy while remaining vegetables are soft (grade C for carrots, grade B for green beans, grade A for other vegetables).

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Some slight color loss may occur.

ODOR: Product may become slightly stale.

FLAVOR: Product may become slightly bland, with an overprocessed flavor.

TEXTURE: Carrots, green beans, and peas may become softer and mushy.

YIELD: 18 portions of 3/4 cup each.

All of the vegetables, especially the carrots and green beans, are initially soft after retorting.

ITEM: POTATOES, SWEET, GLAZED

NSN: 8940-01-153-0710

ITEM SPECIFICATION: MIL-P-44241

APPROX CALORIES/SERVING: 203

CHARACTERISTICS OF ITEM:

APPEARANCE: Cooked potato pieces (1-1/2" long) in a medium glossy syrup containing very small oil droplets and a few potato fines. Color profile: Yellow-orange potatoes in a tan-yellow syrup.

ODOR: Moderately sweet, typical of a cooked sweet potato.

FLAVOR: Moderately sweet.

TEXTURE: Soft sweet potatoes in a thin to moderately thick syrup.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Syrup may become lumpy and thinner.

ODOR: Product may lose some sweetness.

FLAVOR: Product may become slightly acidic and lose its sweetness.

TEXTURE: Product may become "woody", firmer or softer.

YIELD: 18 portions of 1/2 cup each.

ITEM: CORN, WHOLE KERNEL

NSN: 8915-01-158-7947

ITEM SPECIFICATION: MIL-C-44338

APPROX CALORIES/SERVING: 96

CHARACTERISTICS OF ITEM:

APPEARANCE: Whole corn kernels. Color profile: Yellow, will lose some brightness after opening.

ODOR: Typical of thermally processed corn with a slight sweet aroma.

FLAVOR: Typical of canned corn with a slight sweet flavor.

TEXTURE: Crisp corn kernels, chewy skins.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may become slightly darker yellow-tan.

ODOR: Slightly stale or bland

FLAVOR: Slightly stale or bland.

TEXTURE: Kernels may become softer or more fibrous.

YIELD: 18 portions of 3/4 cup each

ITEM: CARROTS, SLICED

NSN: 8915-01-151-6914

ITEM SPECIFICATION: MIL-C-44268

APPROX CALORIES/SERVING: 32

CHARACTERISTICS OF ITEM:

APPEARANCE: Round carrot slices various diameters ranging from (3/4" to 1 1/2"). Color profile: Dark orange outside, orange-yellow center.

ODOR: Typical of heat processed carrots. Overcooked and over mature carrots may have a slightly sour odor.

FLAVOR: Slightly sour with a very slightly sweet flavor. Some users may note a slight bitterness.

TEXTURE: Slightly soft and mushy (grade C for texture is permitted).

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Color may darken (bright orange-yellow color may become dull).

ODOR: Slightly stale.

FLAVOR: Characteristic carrot flavor may become stronger and more bitter.

TEXTURE: Carrots may become softer. An initial softening of the carrots is expected due to retorting.

YIELD: 18 portions of 2/3 cup each

ITEM: PEAS & MUSHROOMS

NSN: 8915-01-165-4928

ITEM SPECIFICATION: MIL-P-44260

APPROX CALORIES/SERVING: 77

CHARACTERISTICS OF ITEM:

APPEARANCE: Medium sized peas with mushroom slices. Color profile: Dull, olive-green peas, tan mushroom slices.

ODOR: Starchy, heat processed peas, slightly briny.

FLAVOR: Typical of heat processed peas and mushrooms with a slight sweet and very slight salt flavor.

TEXTURE: Soft, slightly mushy peas with chewy skins; firm, tender mushrooms.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken; peas may appear wrinkled; and brine may appear slightly cloudy.

ODOR: Product odor may be slightly stale.

FLAVOR: Mushrooms may become bland; peas may become stale and/or starchy.

TEXTURE: Peas may become softer and mushrooms may become rubbery.

YIELD: 18 portions of 3/4 cup each



ITEM: CORN, SWEET, CREAM STYLED

NSN: 8915-01-151-9936

ITEM SPECIFICATION: MIL-C-44339

APPROX CALORIES/SERVING: 130

CHARACTERISTICS OF ITEM:

APPEARANCE: Whole and broken corn kernels in pureed sauce.  
Color profile: Bright yellow kernels and a light yellow puree.

ODOR: Heat processed corn, slightly sweet.

FLAVOR: Heat processed corn, moderately sweet.

TEXTURE: Firm, chewy corn kernels, medium thick puree.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Sauce will be thicker or thinner.

ODOR: Scorched or starchy.

FLAVOR: Product may become bland or have a scorched or starchy flavor.

TEXTURE: Sauce may become thicker or thinner.

YIELD: 18 portions of 3/4 cup each

ITEM: PEAS & CARROTS

NSN: 8915-01-151-6917

ITEM SPECIFICATION: MIL-P-44287

APPROX CALORIES/SERVING: 58

CHARACTERISTICS OF ITEM:

APPEARANCE: Medium sized peas, small carrot dices with a few broken pieces and skins. Color profile: Light olive green peas and orange carrots.

ODOR: Typical of heat processed peas and carrots.

FLAVOR: Typical of heat processed peas and carrots with a slight sweet and slight salt flavor.

TEXTURE: Soft peas with chewy skins; soft, mushy carrots (grade C for texture).

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly; peas may appear wrinkled; and brine may be slightly cloudy.

ODOR: Product may become slightly stale.

FLAVOR: Product may become slightly bitter or stale, and have a stronger carrot flavor.

TEXTURE: Peas may become slightly softer and carrots may become more mushy.

YIELD: 18 servings of 3/4 cup each

ITEM: CARROTS, GLAZED

NSN: 8940-01-151-6910

ITEM SPECIFICATION: MIL-C-44268

APPROX CALORIES/SERVING: 169

CHARACTERISTICS OF ITEM:

APPEARANCE: Round carrot slices (maximum 1-1/4" chunks) in a thick, smooth, glossy syrup. Color profile: deep orange carrot chunks and a tan yellow sauce.

ODOR: Sweet, heat-processed carrots.

FLAVOR: Moderate brown sugar sweetness, heat processed carrots, with a very slight sour flavor.

TEXTURE: Tender, slightly firm carrots, in a smooth thick syrup.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Syrup may darken and become thicker (with gel lumps) or thinner.

ODOR: Carrot aroma will become stronger.

FLAVOR: Characteristic carrot flavor will become stronger (due to carrot variety) and a slight loss of sweetness in the sauce will be exhibited.

TEXTURE: Carrots may become slightly softer and the syrup thick, lumpy or thinner. Carrot softening due to retorting and age.

YIELD: 18 portions of 3/4 cup each

ITEM: CAKE, SPICE THERMOHYDROSTABILIZED

NSN: 8920-01-144-0565

ITEM SPECIFICATION: MIL-C-44235

APPROX CALORIES/SERVING: 207

CHARACTERISTICS OF ITEM:

APPEARANCE: Dense, medium grained cake with some airholes.  
Color profile: Brown crusted top, thicker brown  
bottom crust, tan color with spice specks

ODOR: Slightly sweet with a mild spice aroma.

FLAVOR: Sweet, mild spice, slight nutmeg, and a slightly eggy  
flavor.

TEXTURE: Dense, very slightly moist to dry.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product will become slightly darker or golden tan.

ODOR: Product may become stale or lose some spice aroma.

FLAVOR: Slightly stale and may exhibit a loss of the spice  
flavor

TEXTURE: Product may become slightly more dense or may become  
more dry.

Vacuum examination will be IAW procedures given in this appendix  
Heating improves odor, flavor and texture.

YIELD: 18 portions cut 3 rows x 6 rows each

ITEM: CAKE, CHOCOLATE, BROWNIE THERMOHYDROSTABILIZED

NSN: 8920-01-151-8839

ITEM SPECIFICATION: MIL-C-44235

APPROX CALORIES/SERVING: 278

CHARACTERISTICS OF ITEM:

APPEARANCE: Compact, fine grained dense chocolate cake with nuts. Color profile: medium brown cake with cream colored nuts.

ODOR: Sweet, chocolate.

FLAVOR: Moderate sweet, moderate chocolate, slightly starchy.

TEXTURE: dense, dry, crumbly.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Further darkening may occur.

ODOR: Product may become slightly stale or slightly rancid.

FLAVOR: Slightly stale. Product may exhibit a slight chocolate flavor loss and nuts may become slightly rancid.

TEXTURE: Product may become slightly drier, more crumbly or firmer.

YIELD: 18 portions, cut 3 rows x 6 rows

ITEM: CHOCOLATE PUDDING

NSN: 8940-01-159-1569

ITEM SPECIFICATION: EE-P-2191

APPROX CALORIES/SERVING: 307

CHARACTERISTICS OF ITEM:

APPEARANCE: Smooth, medium thick chocolate pudding. Color  
Profile: Milk chocolate brown.

ODOR: Sweet, typical of heat processed milk cocoa.

FLAVOR: Sweet, full milk cocoa flavor.

TEXTURE: Smooth, medium thick pudding (slight variation  
expected).

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly; surface may exhibit a  
slight "skin" covering; slight syneresis expected.

ODOR: Product may exhibit a slight scorched milk odor.

FLAVOR: Product may become slightly bitter or have a slight  
scorched milk flavor.

TEXTURE: Product may become slightly thicker or firmer.

YIELD: 18 portions of 3/4 cup each

ITEM: APPLE COFFEE CAKE, THERMOHYDROSTABILIZED

NSN: 8920-01-151-6922

ITEM SPECIFICATION: MIL-C-44235

APPROX CALORIES/SERVING: 230

CHARACTERISTICS OF ITEM:

APPEARANCE: Compact, fine grained textured cake with tan pieces of rehydrated apple. Color profile: Golden brown cake surface, darker tan apple pieces: inside is a light yellow.

ODOR: Sweet, cooked apple and cinnamon.

FLAVOR: Typical of a cooked apple cake with a sweet, cinnamon flavor.

TEXTURE: Dense, compact dry cake.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken slightly.

ODOR: Product may become slightly stale, with some loss of apple odor.

FLAVOR: Slightly stale. Product may become somewhat bland and bitter (stronger cinnamon).

TEXTURE: Product may become slightly drier and more crumbly.

YIELD: 18 portions, cut 3 rows x 6 rows each

ITEM: CAKE, MARBLE, THERMOHYDROSTABILIZED

NSN: 8920-01-173-1939

ITEM SPECIFICATION: MIL-C-44235

APPROX CALORIES/SERVING: 221

CHARACTERISTICS OF ITEM:

APPEARANCE: Fine grained, slightly dense marbled chocolate and white cake. Color profile: Medium brown and off-white cakes swirled together.

ODOR: Moderate sweet, moderate to high chocolate, slight vanilla.

FLAVOR: Moderate sweet and chocolate with a slight starchy aroma.

TEXTURE: Tender, slight to moderate dry, crumbly.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: White cake portion may appear tannish in color. Amount and degree of marbling varies from cake to cake.

ODOR: Product may become slightly stale.

FLAVOR: Slightly stale and chocolate cake may become slightly bitter.

TEXTURE: Product may become slightly to moderately dry.

YIELD: 18 portions cut 3 rows x 6 rows each.



ITEM: CAKE, POUND THERMOHYDROSTABILIZED

NSN: 8920-01-173-1940

ITEM SPECIFICATION: MIL-C-44235

APPROX CALORIES/SERVING: 330

CHARACTERISTICS OF ITEM:

APPEARANCE: Fine grained, dense cake structure, smooth top.  
Color profile: Light tan top surface, light, bright  
pale yellow interior, brown bottom and side surface.

ODOR: Moderate sweet with a lemon/eggy cake odor.

FLAVOR: Lemon flavored cake with a slight sweet and vanilla  
flavor.

TEXTURE: Fine, slightly dense and slightly dry.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may darken and exhibit a tan-yellow interior.

ODOR: Product may become slightly stale, slightly rancid, and  
exhibit a slight loss of the sweet, lemon odor.

FLAVOR: Slightly stale or slightly rancid. Product may have a  
slight flavor loss and/or may taste oily.

TEXTURE: Product may become moderately dry.

YIELD: 18 portions cut 3 rows x 6 rows each.

ITEM: APPLE DESSERT

NSN: 8940-01-147-7855

ITEM SPECIFICATION: MIL-A-44255

APPROX CALORIES/SERVING: 205

CHARACTERISTICS OF ITEM:

APPEARANCE: Relatively uniform sized apple slices in a smooth, thick sauce with dark spice specks. Color profile: Light yellow, straw-colored apples in a yellow-tan sauce. Spice specks are dark brown.

ODOR: Slightly sweet with a slight to moderate spicey (nutmeg) cooked apple aroma.

FLAVOR: Typical of cooked apples with a slightly sweet and spicey (nutmeg and cinnamon) flavor.

TEXTURE: Slight to medium firm cooked apples in a smooth sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Product may become a little darker.

ODOR: Product may become slightly stale and exhibit a slight loss of apple and spice odor.

FLAVOR: Product may exhibit some loss of spice flavor and may become a little bitter due to the spices.

TEXTURE: Apples may become a little softer.

YIELD: 18 portions of 3/4 cup each

ITEM: CHERRY DESSERT

NSN: 8940-01-152-5507

ITEM SPECIFICATION: MIL-C-44269

APPROX CALORIES/SERVING: 201

CHARACTERISTICS OF ITEM:

APPEARANCE: Irregular shaped pitted sour type cherries in a thick, smooth, glossy sauce. Color profile: Varying shades of red cherries in a pinkish red to mahogany colored sauce.

ODOR: Sweet cooked cherries with a very slight cooked starch aroma.

FLAVOR: Moderately sweet with a moderate to high sour, cooked cherry flavor.

TEXTURE: Moderately soft, slightly chewy cherries in a thick smooth sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: Cherries may become slightly brown.

ODOR: Product may become slightly stale and lose some of the cherry aroma.

FLAVOR: Product may become slightly bitter and more tart. A slight fermentation of the flavor may be observed.

TEXTURE: Sauce may become thinner and cherries may become softer.

YIELD: 18 portions of 3/4 cup each

ITEM: BLUEBERRY DESSERT

NSN: 8940-01-151-5464

ITEM SPECIFICATION: MIL-B-44256

APPROX CALORIES/SERVING: 175

CHARACTERISTICS OF ITEM:

APPEARANCE: Slightly irregular, whole, round blueberries in a glossy thick sauce. Color profile: Deep blue-purple.

ODOR: Typical of sweet, heat-processed blueberries.

FLAVOR: Cooked blueberries, moderately sweet.

TEXTURE: Tender blueberries, with small seeds in a smooth sauce.

EST SHELF LIFE AT 70 DEGREES F: 36 months

EXPECTED DETERIORATIVE CHANGES:

APPEARANCE: There may be evidence of syneresis (weeping of water from the sauce), and break up of the berries.

ODOR: Product may become slightly stale, sour.

FLAVOR: Slightly stale or sour. A slightly fermented flavor may develop.

TEXTURE: Sauce may become slightly to moderately thinner; berries may become even softer.

YIELD: 18 portions of 3/4 cup each.

APPENDIX C  
SAMPLE OF VOLUNTARY CONSUMER COMMENTS

U.S. ARMY NATICK RESEARCH & DEVELOPMENT LABS  
SATL160 LIST OF COMMENTS FOR TEST SESSION 050887  
TEST NAME: SLICED CARROTS

DATE: 05/07/87  
PAGE: 2  
TEST DATE: 05/07/87

SAMPLE: 2B69 - SLICED CARROTS, 3 YR, 70 DEG F, TP, SIDES

1. FLAVOR NEEDS HELP TEXTURE OK
2. I DO NOT LIKE THE FLAVOR
3. TOO SOGGY
4. SLIGHTLY SOUR TASTE
5. DO NOT LIKE CARROTS AT ALL THIS WAY.
6. TASTES GOOD, BUT TEXTURE IS VERY MUSHY
7. A LITTLE OVER COOKED
8. TASTES TERRIBLE
9. BITTER TASTING AND LOW QUALITY
10. OVERCOOKED CAN FLAVOR

Appendix C (cont)

U.S. ARMY Natick Research & Development Labs  
SATL160 LIST OF COMMENTS FOR TEST SESSION 050887  
TEST NAME: SLICED CARROTS

DATE: 05/07/87  
PAGE: 3  
TEST DATE: 05/07/87

SAMPLE: 2870 - SLICED CARROTS, 3 YR, 70 DEG F, TP, SIDES

1. FLAVOR/TEXTURE FAIR
2. I DO NOT LIKE THE FLAVOR
3. OVERCOOKED POOR FLAVOR AND TASTE
4. SOUR TASTE
5. DO NOT LIKE CARROTS.
6. OK TASTE, BUT NOT GREAT COLOR IS STILL NOT  
RIGHT KIND OF BROWN
7. OVER COOKED
8. BITTER AND MUSHY
9. WHAT DID YOU DO TO THESE DEFENSELESS CARROTS?
10. OVERCOOKED CAN FLAVOR

Appendix C (cont)

U.S. ARMY NATICK RESEARCH & DEVELOPMENT LABS  
SATL160 LIST OF COMMENTS FOR TEST SESSION 050887  
TEST NAME: SLICED CARROTS

DATE: 05/07/87  
PAGE: 1  
TEST DATE: 05/07/87

SAMPLE: 2868 - SLICED CARROTS, 3 YR, 70 DEG F, TP, SIDES

1. BEST FLAVOR/TEXTURE OF TEST
2. FLAVOR IS FAIR
3. POOR FLAVOR AND TASTE
4. GOOD
5. DO NOT LIKE CARROTS.
6. NO CARROT FLAVOR, COLOR IS BROWN / NOT RIGHT FOR CARROTS. ODD TASTE
7. TASTE?
8. GREY SL DIRTY BITTER SWEET FLAVOR
9. BITTER, LOW QUALITY, MUSHY BROKEN PIECES
10. 1kbfswa
11. OVERCOOKED CAN FLAVOR

Appendix C (cont)

U.S. ARMY NATICK RESEARCH & DEVELOPMENT LABS  
SATL160 LIST OF COMMENTS FOR TEST SESSION 050887  
TEST NAME: SLICED CARROTS

DATE: 05/07/87  
PAGE: 4  
TEST DATE: 05/07/87

SAMPLE: 2871 - SLICED CARROTS, 3 YR, 70 DEG F, TP, SIDES

1. NO FLAVOR
2. FLAVOR IS FAIR DO NOT LIKE APPEARANCE
3. POOR FLAVOR AND TASTE MABEY OVERCOOKED
4. GOOD
5. VILE.
6. TEXTURE BETTER, FIRMER CARROT SLICES, NDT MUSHY
7. OVER COOKED NO FLAVOR
8. TOO BITTER
9. BITTER, MUSHY, LOW QUALITY  
TASTE LIKE TURNIPS
10. I USUALLY LIKE CARROTS
11. OVERCOOKED CAN FLAVOR



## APPENDIX D

### TRAY PACK PRODUCTS

#### BEEF CATEGORY (17 items)

Beef Stew  
Beef in BBQ sauce  
Beef Pepper Steak  
Roast Beef in Gravy  
Meatloaf in Gravy  
Creamed Ground Beef  
Chili Con Carne  
Beef with Carrots  
Swedish Meatballs  
Stuffed Peppers  
Spaghetti & Meatballs  
Beef Tips with Gravy  
Macaroni & Beef  
Beef Swiss Steak  
Lasagna  
Meatballs & Cabbage  
Frankfurters in Brine

#### POULTRY CATEGORY (7 items)

Chicken Slices w/Gravy  
Chicken a la King  
Chicken Stew  
Chicken Breasts w/Gravy  
Chicken & Noodles  
Chicken Cacciatore  
Turkey Slices w/Gravy

#### PORK CATEGORY (5 items)

Canadian Bacon  
Pork Sausage Links  
Pork Slices w/Gravy  
Pork w/BBQ Sauce  
Ham Slices

#### STARCH CATEGORY (9 items)

Escalloped Potatoes  
Macaroni & Cheese  
Beans with Bacon  
Buttered Noodles  
Potatoes w/Butter Sauce  
Potato Salad  
White Rice  
Spanish Rice  
Macaroni Salad

#### VEGETABLE CATEGORY (9 items)

Green Beans  
Mixed Vegetables  
Glazed Sweet Potatoes  
Whole Kernel Corn  
Sliced Carrots  
Peas & Mushrooms  
Creamed Corn  
Peas & Carrots  
Glazed Carrots

#### DESSERT CATEGORY (9 items)

Spice Cake  
Chocolate Cake  
Chocolate Pudding  
Apple Coffee Cake  
Marble Cake  
Pound Cake  
Apple Dessert  
Cherry Dessert  
Blueberry Dessert

